Access DB# 118766

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN MAPLES Examiner # : 62294 Date: 4-6-04
Art Unit: 1745 Phone Number 2-1287 Serial Number: 10/045,046
Mail Box and Bldg/Room Location: REM-6-C89 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: METHOD OF PRODUCING ELECTRODE

Inventors (please provide full names): XIE, GANG

Earliest Priority Filing Date: 1/15/2001

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

EXAMPLES — ELECTRODE → CARBON FIBER OR CARBON POWDER

— WATER REPELLENT → PTFE

(Closest art is toward the beginning of printout.)

****

STAFF USE ONLY

Searcher: EJ
Searcher Phone #:
Searcher Location:
Date Searcher Picked Up:
Date Completed: 4-6-04
Searcher Prep & Review Time: 5
Clerical Prep Time:
Online Time: 100

Type of Search

NA Sequence (#)
AA Sequence (#)
Structure (#)
Bibliographic ✓
Litigation
Fulltext
Patent Family
Other

Vendors and cost where applicable

STN $407.12
Dialog
Questel/Orbit
Dr.Link
Lexis/Nexis
Sequence Systems
WWW/Internet
Other (specify)

PTO-1590 (8-01)

Access DB# 118766

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Title of Invention: METHOD OF PRODUCING ELECTRODE

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Earliest Priority Filing Date: 1/15/2001

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

A method of producing an electrode for fuel cells, comprising the steps of:

establishing a water repellent finished state of an electrode structure which is electrically conductive, and gas permeable;

carrying a catalyst on the water repellent finished electrode structure; and

applying ion exchange resin onto the catalyst carrying electrode structure.

EXAMPLES — ELECTRODE → CARBON FIBER OR CARBON POWDER

— WATER REPELLENT → PTFE

****

STAFF USE ONLY **Type of Search** **Vendors and cost where applicable**

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=> file home
FILE 'HOME' ENTERED AT 15:04:22 ON 06 APR 2004


=> display history full l1-

     FILE 'REGISTRY' ENTERED AT 14:14:03 ON 06 APR 2004
                E POLYTETRAFLUOROETHYLENE/CN
L1            1 SEA POLYTETRAFLUOROETHYLENE/CN

     FILE 'HCA, WPIX, JAPIO' ENTERED AT 14:18:27 ON 06 APR 2004
L2        40578 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L3        22573 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L4        15047 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
     TOTAL FOR ALL FILES
L5        78198 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L6       710011 SEA ELECTROD## OR CATHOD## OR ANOD##
L7       601916 SEA ELECTROD## OR CATHOD## OR ANOD##
L8       462203 SEA ELECTROD## OR CATHOD## OR ANOD##
     TOTAL FOR ALL FILES
L9      1774130 SEA ELECTROD## OR CATHOD## OR ANOD##
L10     1216473 SEA CATALY? OR CAT#
L11      322067 SEA CATALY? OR CAT#
L12      117488 SEA CATALY? OR CAT#
     TOTAL FOR ALL FILES
L13     1656028 SEA CATALY? OR CAT#
L14       70164 SEA (ION## OR CATION? OR ANION?)(3A)EXCHANG?(3A)(RESIN?
                OR POLYM? OR COPOLYM? OR HOMOPOLYM? OR TERPOLYM? OR
                MEMBRAN?)
L15       27076 SEA (ION## OR CATION? OR ANION?)(3A)EXCHANG?(3A)(RESIN?
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                MEMBRAN?)
L16       11602 SEA (ION## OR CATION? OR ANION?)(3A)EXCHANG?(3A)(RESIN?
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                MEMBRAN?)
     TOTAL FOR ALL FILES
L17      108842 SEA (ION## OR CATION? OR ANION?)(3A) EXCHANG?(3A)(RESIN?
                OR POLYM? OR COPOLYM? OR HOMOPOLYM? OR TERPOLYM? OR
                MEMBRAN?)
L18       57526 SEA L1 OR PTFE OR TEFLON# OR POLY(2A)TETRAFLUOROETHYLENE#
                 OR POLYTETRAFLUOROETHYLENE# OR POLY(2A)TETRA#(2A)FLUORO#
                (2A)ETHYLENE# OR POLY(2A)TETRAFLUORO#(2A)ETHYLENE#
L19       35979 SEA L1 OR PTFE OR TEFLON# OR POLY(2A)TETRAFLUOROETHYLENE#
                 OR POLYTETRAFLUOROETHYLENE# OR POLY(2A)TETRA#(2A)FLUORO#
                (2A)ETHYLENE# OR POLY(2A)TETRAFLUORO#(2A)ETHYLENE#
L20        9989 SEA L1 OR PTFE OR TEFLON# OR POLY(2A)TETRAFLUOROETHYLENE#
                 OR POLYTETRAFLUOROETHYLENE# OR POLY(2A)TETRA#(2A)FLUORO#
                (2A)ETHYLENE# OR POLY(2A)TETRAFLUORO#(2A)ETHYLENE#
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TOTAL FOR ALL FILES

L21 103494 SEA L1 OR PTFE OR TEFLON# OR POLY(2A) TETRAFLUOROETHYLENE # OR POLYTETRAFLUOROETHYLENE# OR POLY(2A) TETRA#(2A) FLUORO#(2A) ETHYLENE# OR POLY(2A) TETRAFLUORO#(2A) ETHYLENE#

L22 3112 SEA L18(3A)L6

L23 443 SEA L19(3A)L7

L24 107 SEA L20(3A)L8

TOTAL FOR ALL FILES

L25 3662 SEA L21(3A) L9

L26 20510 SEA L2 AND L6

L27 9590 SEA L3 AND L7

L28 6982 SEA L4 AND L8

TOTAL FOR ALL FILES

L29 37082 SEA L5 AND L9

L30 766 SEA L26 AND L22

L31 67 SEA L27 AND L23

L32 8 SEA L28 AND L24

TOTAL FOR ALL FILES

L33 841 SEA L29 AND L25

L34 521 SEA L30 AND L10

L35 40 SEA L31 AND L11

L36 6 SEA L32 AND L12

TOTAL FOR ALL FILES

L37 567 SEA L33 AND L13

L38 42 SEA L30 AND L14

L39 5 SEA L31 AND L15

L40 1 SEA L32 AND L16

TOTAL FOR ALL FILES

L41 48 SEA L33 AND L17

FILE 'LCA' ENTERED AT 14:25:45 ON 06 APR 2004

L42 7647 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR LEAF? OR FOIL? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR OVERSPREAD?)/BI,AB

L43 308 SEA WATERPROOF? OR WATERREPEL? OR WATERRESILIEN? OR WATERRESIST? OR MOISTUREPROOF? OR MOISTURERESIST? OR MOISTUREREPEL? OR MOISTURERESILIEN? OR (WATER# OR H2O OR MOISTURE#)(2A)(PROOF? OR RESIST? OR RESILIEN? OR REPEL? OR SUPPRESS? OR RETARD? OR PREVENT? OR BLOCK? OR PROHIBIT?)

L44 55 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR OVERSPREAD? OR CAPSULAT? OR ENCAPSUL?)(3A)L43

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L45 30184 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR OVERSPREAD? OR CAPSULAT? OR ENCAPSUL?)(3A)L43

L46 32664 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR OVERSPREAD? OR CAPSULAT? OR ENCAPSUL?)(3A)L43

L47 17887 SEA (FILM? OR THINFILM? OR LAYER? OR OVERLAY? OR OVERLAID? OR LAMIN? OR LAMEL? OR SHEET? OR COAT? OR TOPCOAT? OR OVERCOAT? OR VENEER? OR SHEATH? OR COVER? OR ENVELOP? OR ENCAS? OR ENWRAP? OR OVERSPREAD? OR CAPSULAT? OR ENCAPSUL?)(3A)L43

TOTAL FOR ALL FILES

L48 80735 SEA L44

L49 20 SEA L34 AND L45

L50 1 SEA L35 AND L46

L51 2 SEA L36 AND L47

TOTAL FOR ALL FILES

L52 23 SEA L37 AND L48

L53 100 SEA L26 AND L45

L54 140 SEA L27 AND L46

L55 146 SEA L28 AND L47

TOTAL FOR ALL FILES

L56 386 SEA L29 AND L48

L57 59 SEA L53 AND L18

L58 26 SEA L54 AND L19

L59 31 SEA L55 AND L20

TOTAL FOR ALL FILES

L60 116 SEA L56 AND L21

L61 45 SEA L57 AND L10

L62 20 SEA L58 AND L11

L63 23 SEA L59 AND L12

TOTAL FOR ALL FILES

L64 88 SEA L60 AND L13

L65 2 SEA L57 AND L14

L66 2 SEA L58 AND L15

L67 3 SEA L59 AND L16

TOTAL FOR ALL FILES

L68 7 SEA L60 AND L17

L69 36939 SEA (GAS## OR GASEOUS? OR GASIF?)(2A)(PERMEA? OR SEMIPERMEA? OR DIFFUS?)

L70 22424 SEA (GAS## OR GASEOUS? OR GASIF?)(2A)(PERMEA? OR SEMIPERMEA? OR DIFFUS?)

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L71        10374 SEA (GAS## OR GASEOUS? OR GASIF?)(2A)(PERMEA? OR
                 SEMIPERMEA? OR DIFFUS?)
     TOTAL FOR ALL FILES
L72        69737 SEA (GAS## OR GASEOUS? OR GASIF?)(2A)(PERMEA? OR
                 SEMIPERMEA? OR DIFFUS?)
L73           16 SEA L61 AND L69
L74           12 SEA L62 AND L70
L75           10 SEA L63 AND L71
     TOTAL FOR ALL FILES
L76           38 SEA L64 AND L72
L77          100 SEA L2 AND L6 AND L45
L78          140 SEA L3 AND L7 AND L46
L79          146 SEA L4 AND L8 AND L47
     TOTAL FOR ALL FILES
L80          386 SEA L5 AND L9 AND L48
L81           74 SEA L77 AND L10
L82           93 SEA L78 AND L11
L83          103 SEA L79 AND L12
     TOTAL FOR ALL FILES
L84          270 SEA L80 AND L13
L85            4 SEA L77 AND L14
L86           11 SEA L78 AND L15
L87           13 SEA L79 AND L16
     TOTAL FOR ALL FILES
L88           28 SEA L80 AND L17
L89           59 SEA L77 AND L18
L90           26 SEA L78 AND L19
L91           31 SEA L79 AND L20
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L92          116 SEA L80 AND L21
L93           45 SEA L81 AND L89
L94           20 SEA L82 AND L90
L95           23 SEA L83 AND L91
     TOTAL FOR ALL FILES
L96           88 SEA L84 AND L92

     FILE 'HCA' ENTERED AT 14:58:35 ON 06 APR 2004
L97            4 SEA L65 OR L85
L98           30 SEA (L49 OR L73) NOT L97
L99           54 SEA (L38 OR L61) NOT (L97 OR L98)

     FILE 'WPIX' ENTERED AT 15:00:22 ON 06 APR 2004
L100           8 SEA L39 OR L50 OR L66
L101          18 SEA (L74 OR L86) NOT L100
L102           8 SEA L62 NOT (L100 OR L101)

     FILE 'JAPIO' ENTERED AT 15:01:55 ON 06 APR 2004
L103          10 SEA L32 OR L40 OR L51 OR L67
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L104 17 SEA (L75 OR L87) NOT L103
L105 12 SEA L63 NOT (L103 OR L104)

FILE 'HCA' ENTERED AT 15:04:35 ON 06 APR 2004

=> d l97 1-4 cbib abs hitind

L97 ANSWER 1 OF 4 HCA COPYRIGHT 2004 ACS on STN
139:182911 Manufacture of **fuel cell electrode**. Mineo, Norikazu; Konuma, Hiroshi; Komukai, Masahiro (Mitsubishi Heavy Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003242988 A2 20030829, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-43986 20020220.

AB The **electrode** is manufd. by forming a conductive **water-repellent layer** on 1 side of a collector; applying a slurry, contg. an **electrode** catalyst and an **ion-exchange resin**, as a reaction **layer** on the **water repellent layer**; holding the reaction layer horizontally at a 1st predetd. temp.; and drying the reaction layer at a 2nd predetd. temp. Another type of the **electrode** is manufd. by drying the reaction layer at the 1st predetd. temp., and flattening the surface of the reaction layer by pressing.

IC ICM H01M004-88
ICS H01M004-92; H01M004-96; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell electrode** manuf **water repellent** reaction **layer**

IT **Fuel cell electrodes**
(manuf. of **fuel cell electrodes** contg. **water repellent layers** and reaction **layers** for **fuel cells**)

IT Fluoropolymers, uses
(**water repellent layer**; manuf. of **fuel cell electrodes** contg. **water repellent layers** and reaction **layers** for **fuel cells**)

IT 12779-05-4
(manuf. of **fuel cell electrodes** contg. **water repellent layers** and reaction **layers** for **fuel cells**)

IT 7440-44-0, Carbon, uses
(manuf. of **fuel cell electrodes**

contg. **water repellent layers** and reaction **layers** for **fuel cells**)

IT 56-81-5, Glycerin, uses **9002-84-0, Polytetrafluoroethylene**
(**water repellent layer**; manuf. of **fuel cell electrodes** contg. **water repellent layers** and reaction **layers** for **fuel cells**)

L97 ANSWER 2 OF 4 HCA COPYRIGHT 2004 ACS on STN
138:324078 Manufacture of **electrode** for solid polymer **fuel cell**. Watanabe, Satoru; Yasutake, Akinobu; Nojima, Shigeru (Mitsubishi Heavy Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003123776 A2 20030425, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-310252 20011005.

AB The **electrode** is manufd. by prepg. a colloidal mixt. of a **cation exchange polymer** and a noble metal; and applying the mixt. on a porous, conductive and **water repellent film** to form an **electrode** catalyst layer. Another type of the **electrode** is manufd. by prepg. the colloidal mixt.; applying the mixt. on the film and a metal plate; and heating the film to form the **electrode** catalyst layer.

IC ICM H01M004-88
ICS H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell electrode** catalyst manuf noble metal polymer mixt

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)

IT **Fuel cells**
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)

IT Fluoropolymers, uses
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)

IT **Fuel cell electrodes**
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymers** and noble metals for solid polymer **fuel cells**)

IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)
IT 7440-06-4, Platinum, uses 12779-05-4
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)
IT 64-17-5, Ethanol, uses 7732-18-5, Water, uses
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)
IT 7440-44-0, Carbon, uses **9002-84-0, Teflon**
(manuf. of **electrode** catalyst layers contg. colloidal mixts. of **cation exchange polymer** and noble metals for solid polymer **fuel cells**)

L97 ANSWER 3 OF 4 HCA COPYRIGHT 2004 ACS on STN
134:254652 Manufacture of **electrode** with improved gas diffusion layer for polymer electrolyte **fuel cell**. Yoshitake, Masaru; Kunisa, Yasuhiro; Endo, Eiji (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001085019 A2 20010330, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-262921 19990917.
AB The **electrode** is manufd. by forming a **water-repellent** C **layer** on a carbon cloth, hot-pressing the cloth to give a gas diffusion layer with flat surface, and placing a catalyst layer in contact with the **water-repellent layer** surface. The manufg. process of the cell is also described. The flat gas diffusion layer decreases damage on an **ion exchange membrane** when the **electrode** is connected to the membrane in fabrication of the cell.
IC ICM H01M004-88
ICS H01M004-88; H01M004-86; H01M008-02; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST gas diffusion layer **electrode fuel cell**; **water repellent** carbon **layer** **electrode fuel cell**; carbon cloth gas

diffusion layer **fuel cell**

IT Carbon fibers, uses
(fabrics; manuf. of **electrode** with flat gas diffusion **layer** of **water-repellent** carbon-**coated** carbon cloth for polymer electrolyte **fuel cell**)

IT **Fuel cell electrodes**
(manuf. of **electrode** with flat gas diffusion **layer** of **water-repellent** carbon-**coated** carbon cloth for polymer electrolyte **fuel cell**)

IT Carbon black, uses
Fluoropolymers, uses
(**water-repellent coating** component; manuf. of **electrode** with flat gas diffusion **layer** of **water-repellent** carbon-**coated** carbon cloth for polymer electrolyte **fuel cell**)

IT 331640-46-1, Carbel CL
(gas diffusion layer; manuf. of **electrode** with flat gas diffusion **layer** of **water-repellent** carbon-**coated** carbon cloth for polymer electrolyte **fuel cell**)

L97 ANSWER 4 OF 4 HCA COPYRIGHT 2004 ACS on STN

125:38114 **Electrodes** for polymer electrolyte electrochemical **cells**, especially **fuel cells**. Watanabe, Masahiro; Inoe, Masahiko (Tanaka Precious Metal Ind, Japan; Watanabe Masahiro; Sutonharuto Asosheetsu Inc). Jpn. Kokai Tokkyo Koho JP 08096813 A2 19960412 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-254447 19940922.

AB The **electrodes** have a catalyst layer contg. a **cation exchange resin** coated conductive catalyst support and a fluoropolymer coated conductive support. The **electrodes** have low water retention and are esp. suitable for **fuel cell cathodes** for high c.d.

IC ICM H01M004-86
ICS H01M004-88; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell cathode** catalyst support coating; **cathode** catalyst support cation exchanger coating; fluoropolymer coating **cathode** catalyst layer

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, coating on catalyst support; electrochem. cell **electrodes** with porous and **water-repellent** catalyst **layer**)

IT **Cathodes**
(**fuel-cell, cathode** catalyst layers

contg. Nafion coated platinum catalyst loaded carbon powder and fluorinated polyethylene coated carbon black for polymer electrolyte **fuel cells**)

IT Fluoropolymers
(polyoxyalkylene-, sulfo-contg., ionomers, coating on catalyst support; electrochem. cell **electrodes** with porous and **water-repellent** catalyst **layer**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., catalyst layers contg. Nafion coated platinum catalyst loaded carbon powder for solid polymer electrolyte **fuel cells**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., coating on catalyst support; electrochem. cell **electrodes** with porous and **water-repellent** catalyst **layer**)

IT 9002-88-4D, Polyethylene, fluorinated
(catalyst layers contg. fluorinated polyethylene coated carbon black for polymer electrolyte **fuel cell cathodes**)

=> file wpix
FILE 'WPIX' ENTERED AT 15:05:54 ON 06 APR 2004
COPYRIGHT (C) 2004 THOMSON DERWENT

FILE LAST UPDATED: 5 APR 2004 <20040405/UP>
MOST RECENT DERWENT UPDATE: 200423 <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d l100 1-8 max

L100 ANSWER 1 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-213490 [20] WPIX
DNN N2004-169147 DNC C2004-084574
TI High temperature polymer electrolyte membrane for **fuel cells**, comprises modified polybenzimidazole having specified number average molecular weight.
DC A26 A85 L03 X16
IN CABASSO, I; JOHNSON, F E; YUAN, Y
PA (CABA-I) CABASSO I; (JOHN-I) JOHNSON F E; (YUAN-I) YUAN Y
CYC 1
PI US 2004028976 A1 20040212 (200420)* 21p H01M008-10
ADT US 2004028976 A1 US 2002-213694 20020807
PRAI US 2002-213694 20020807
IC ICM H01M008-10
ICS C08G069-44; C08J005-22

AB US2004028976 A UPAB: 20040324
NOVELTY - A polymer electrolyte membrane comprises a modified polybenzimidazole (I) having a number average molecular weight of 2000-1000000 Da, and polysulfonic acid at a weight ratio of 1:1-1:20.

DETAILED DESCRIPTION - A polymer electrolyte membrane (PEM) comprises a modified polybenzimidazole (PBI) of formula (I) having a number average molecular weight of 2000-1000000 Da, and polysulfonic acid at a weight ratio of 1:1-1:20.

X = H, (CH2)3SO3H, PO(OCH2CH3)2, or PO(OCH3)2; and

R = Br or PO(OCH2CH3)2.

INDEPENDENT CLAIMS are also included for:

(a) a polymer electrolyte **fuel cell** comprising an **anode**, a **cathode**, and a blend membrane; and

(b) a process of preparing a blend membrane, comprising separately dissolving a phosphonylated polybenzimidazole and a polysulfonic acid, mixing polymer solutions, casting the blend solution onto a clean surface, and drying the cast blend solution.

USE - For **fuel cells**.

ADVANTAGE - The material is inexpensive and efficient. It has high thermal and chemical stability, ionic conductivity, and miscibility with other polymers. It has good mechanical strength and tractability.

Dwg.0/7

TECH US 2004028976 A1UPTX: 20040324
TECHNOLOGY FOCUS - POLYMERS - Preferred Property: The X and R groups have a degree of substitution of 0.3-2.5 (preferably 0.3-1 or 2-2.5). The **fuel cell** has a current density of 1-2Angstrom/cm2 at 0.5 V and a minimum catalyst loading equivalent of 0.1-0.2 mg/cm2 of platinum on a platinum/carbon **polytetrafluoroethylene electrode** at 5-70 psig reactant gases. The **membrane** has an **ion exchange** capacity of 0.5-9.5 meq H+/g. The dry blend membrane has a thickness of 1-250 mum. Preferred Solvent: The modified PBI is soluble in N,N-dimethyl formamide, N,N-dimethyl acetamide, dimethyl sulfoxide, , trifluoroacetic acid, concentrated sulfuric acid, phosphoric acid, methanol, ethanol, and isopropanol. Preferred Material: The polysulfonic acid is sulfonated poly(phenylene oxide), polyether sulfone, or hexafluoro-bisphenol A polysulfone. Preferred Composition: The blend membrane comprises polymers (1-23 wt.%). Preferred Process: The blend membrane is heat-treated at 150degreesC at 60 psig.

ABEX US 2004028976 A1UPTX: 20040324
EXAMPLE - PBI (0.13 g) was dissolved in N,N-dimethyl acetamide (7 ml). Diethyl phosphite (0.8 ml) and benzoyl peroxide (1 g) were added directly to the solution of PBI. The solution was heated to 130degreesC and maintained for 1 hour. The modified PBI was

isolated. The resulting modified PBI (0.18 g) was a light orange material and demonstrated good solubility in N,N-dimethyl acetamide and dimethyl sulfoxide. It had a degree of substitution and a charge density of 0.67 and 1.8 meq H+/g, respectively.

FS CPI EPI
FA AB; GI
MC CPI: A07-A03; A07-A03C; A10-E20; A12-E06; L03-E04A2; L03-E04G
EPI: X16-C01
PLE UPA 20040324
[1.1] 2004; D01 D11 D10 D19 D18 D24 D22 D96 D35 D76 D77 D45 D50 D94 D28 D95 D29 D60 D63 F62 F54 D69 Br 7A; S9999 S1627 S1605; S9999 S1605-R; P0793 H0293 D01 D22 D45 F17; L9999 L2391; L9999 L2835; L9999 L2460; M9999 M2835; M9999 M2460
[1.2] 2004; ND01; ND07; Q9999 Q7410 Q7330
[1.3] 2004; K9745-R; Q9999 Q8060; Q9999 Q8764; N9999 N5889-R; N9999 N6439; N9999 N5743; N9999 N6780-R N6655; N9999 N6177-R; B9999 B4580 B4568; B9999 B4682 B4568; B9999 B3269 B3190; B9999 B4091-R B3838 B3747; B9999 B5094 B4977 B4740; B9999 B5630 B3510 B3372
[1.4] 2004; P- 5A; H0157
[1.5] 2004; G2799 G2788 D01 D63 F52 D11 D10 D50 D84; H0226
[1.6] 2004; R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; C999 C088-R C000; C999 C271
[1.7] 2004; R01084 D01 D11 D10 D50 D84 F70; A999 A475
[2.1] 2004; D01 F62; S9999 S1627 S1605; S9999 S1605-R; P0997 P0964 H0293 F34 D01 D18
[2.2] 2004; P1047 P0964 P1490 H0260 F34 F61 D01; S9999 S1627 S1605; S9999 S1605-R
[2.3] 2004; D01 D60 F62; P0000; S9999 S1627 S1605; S9999 S1605-R
[2.4] 2004; R13033 G1150 G1149 G1092 D01 D10 D11 D18 D19 D32 D50 D69 D76 D93 F30 F32 F- 7A; S9999 S1627 S1605; S9999 S1605-R; P1490-R F61 D01; H0011-R; H0293
[2.5] 2004; ND01; ND07; Q9999 Q7410 Q7330
[2.6] 2004; K9745-R; Q9999 Q8060; Q9999 Q8764; N9999 N5889-R; N9999 N6439; N9999 N5743; N9999 N6780-R N6655; N9999 N6177-R; B9999 B4580 B4568; B9999 B4682 B4568; B9999 B3269 B3190; B9999 B4091-R B3838 B3747
[2.7] 2004; R01084 D01 D11 D10 D50 D84 F70; A999 A475
[3.1] 2004; H0000; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; P0511
[3.2] 2004; ND01; ND07; Q9999 Q7410 Q7330
[3.3] 2004; Q9999 Q6791; Q9999 Q7409 Q7330

L100 ANSWER 2 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-250122 [25] WPIX
DNN N2003-198608 DNC C2003-064877
TI **Electrode** used as **anode** or **cathode** for **fuel cell**, has gas diffusion **layer**,

water-repellent layer containing carbon material and **polytetrafluoroethylene**, and **electrode catalyst** layer containing carbon material.

DC A85 L03 X16

IN IWASAKI, K; MIYAMA, T; OHBA, T; ONODERA, M

PA (HOND) HONDA GIKEN KOGYO KK; (HOND) HONDA MOTOR CO LTD

CYC 28

PI EP 1274142 A2 20030108 (200325)* EN 24p H01M004-86
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
JP 2003017071 A 20030117 (200325) 15p H01M004-86
US 2003022057 A1 20030130 (200325) H01M004-96

ADT EP 1274142 A2 EP 2002-254552 20020628; JP 2003017071 A JP 2001-201497 20010702; US 2003022057 A1 US 2002-187552 20020701

PRAI JP 2001-201497 20010702

IC ICM H01M004-86; H01M004-96
ICS H01M004-88

AB EP 1274142 A UPAB: 20030416

NOVELTY - An **electrode** includes a gas diffusion **layer** (6a, 6b), a **water-repellent layer** (30a, 30b) containing carbon material and **polytetrafluoroethylene**, and **electrode catalyst** layer (32a, 32b) containing a carbon material carrying a **catalyst**. The **electrode catalyst** layer has a maximum and minimum thicknesses that differ from each other by less than 30 micro m and cracks whose area is less than 10% of its total area.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for:

(a) a method for manufacturing the above **electrode** (24, 26) comprising:

(1) coating a first paste containing carbon material and polytetrafluoroethylene on a base serving as a gas diffusion layer (6a, 6b);

(2) pressurizing and drying the **coated** paste into a **water-repellent layer** (30a, 30b);

(3) coating a second paste containing a carbon material carrying a **catalyst** on the **water-repellent layer**; and

(4) pressurizing and drying the coated second paste into an **electrode catalyst** layer (32a, 32b) while interposing the base between a porous sheet and a polymer sheet material; and

(b) a **fuel cell** having **anode** and **cathode electrodes** with at least one of the **electrodes** comprising:

(i) a gas diffusion layer (6a, 6b);

(ii) a **water-repellent layer**

(30a, 30b) on the gas diffusion layer, containing a carbon material and polytetrafluoroethylene; and

(iii) an **electrode catalyst** layer (32a, 32b) containing a carbon material carrying a **catalyst** , where the **electrode catalyst** layer has maximum and minimum thicknesses that differ from each other by less than 30 micro m and has cracks whose area is less than 10% of its total area.

USE - The **electrode** is used as **anode** or **cathode** for **fuel cell** (claimed).

ADVANTAGE - The inventive **electrode** has high electric conductivity and uniform charge distribution, and capable of achieving high output at a high current density.

DESCRIPTION OF DRAWING(S) - The figure is an exploded perspective view of an electrolyte **electrode** assembly of a **fuel cell**.

Diffusion layer 6a, 6b

Electrode 24, 26

Water-repellent layer 30a, 30b

Catalyst layer 32a, 32b

Dwg.2/10

TECH EP 1274142 A2 UPTX: 20030410

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Component: The **water-repellent layer** (30a, 30b) has a maximum and minimum thicknesses that differ from each other by less than 40 micrometers, and cracks whose area is less than 5% of its total area.

TECHNOLOGY FOCUS - POLYMERS - Preferred Composition: The **water-repellent layer** comprises 10-40 wt. % **polytetrafluoroethylene**. The **electrode catalyst** layer (32a, 32b) also contains polytetrafluoroethylene.

Preferred Method: The method step (b) is carried out while the base is interposed between a porous sheet and a polymer sheet covering the first paste. The method also involves heating the assembly to remove a remaining solvent from the **water-repellent layer** and to increase its water repellency and bonding strength. In step (e) the assembly is heated remove a remaining solvent from the **electrode catalyst** layer.

FS CPI EPI

FA AB; GI

MC CPI: A04-E08; A08-M09A; A09-A03; A11-B05D; A12-E06A; L03-E04B
EPI: X16-E06

PLE UPA 20030416

[1.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; P0511

[1.2] 018; B9999 B3509 B3485 B3372
[1.3] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q7409 Q7330; N9999 N7090 N7034 N7023; N9999 N7147 N7034 N7023; B9999 B5414-R B5403 B5276; K9483-R; K9676-R; B9999 B5301 B5298 B5276

L100 ANSWER 3 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-676566 [73] WPIX
CR 1996-289224 [30]
DNN N2002-534847 DNC C2002-190863
TI Unitary assembly, e.g. for electrochemical cell, has composite non-porous solid **polymer ion exchange membrane** having preformed **membrane**-support film of porous expanded **polytetrafluoroethylene**, and **electrode.**
DC A14 A85 J03 L03 X16 X25
IN KIROSHI, K
PA (NIGO) JAPAN GORE TEX INC
CYC 5
PI EP 1217680 A2 20020626 (200273)* EN 12p H01M008-10
R: DE FR GB IT SE
ADT EP 1217680 A2 Div ex EP 1995-308882 19951207, EP 2001-129420 19951207
FDT EP 1217680 A2 Div ex EP 718903
PRAI JP 1995-131771 19950530; JP 1994-303672 19941207; JP 1994-304991 19941208
IC ICM H01M008-10
ICS C25B009-00
AB EP 1217680 A UPAB: 20021113
NOVELTY - An unitary assembly has a composite non-porous solid **polymer ion exchange membrane** having planar surfaces (I) and (II), and an **electrode** having two planar surfaces. The non-porous membrane has preformed membrane-support film(s) of porous expanded polytetrafluoroethylene which is made non-porous by using solid **polymer ion exchange resin.**

DETAILED DESCRIPTION - An unitary assembly has a composite non-porous solid **polymer ion exchange membrane** having planar surfaces (I) and (II), and an **electrode** having two planar surfaces. The non-porous membrane has preformed membrane support film(s) of porous expanded polytetrafluoroethylene which is made non-porous by solid **polymer ion exchange resin.**
One surface of **electrode** is in intimate contact with surface (I) of non-porous membrane and bonded to **membrane** by solid **polymer ion exchange resin.**

USE - In electrochemical cell, such as batteries, **fuel cell** and electrolytic reactors.

ADVANTAGE - The unitary assembly has desired cell properties, such as catalyst amounts, gas diffusivity, electronic and ionic conduction. The preformed **electrode**-support film provides enhanced uniformity, reproducibility, strength, reinforcement and handleability to the assembly. The film prevents migration of solvents into adjacent layers and provides greater flexibility in choice of manufacturing method of the assembly.
Dwg.0/0

TECH EP 1217680 A2 UPTX: 20021113
TECHNOLOGY FOCUS - MECHANICAL ENGINEERING - Preferred Composition: The preformed **electrode**-support film having a thickness of 1-20 microm, preferably 3-20 microm ,contains a solid **polymer ion exchange resin,** a catalyst material and a non-catalytic electrically-conductive material.
Preferred Components: Alternatively, the **electrode** in the unitary assembly has a preformed **electrode**-support film of porous expanded polytetrafluoroethylene. The unitary assembly further has another **electrode** having a surface in intimate contact with surface (II) of non-porous membrane. The surface (II) of one **electrode** is in intimate contact with an electrically conductive gas diffusion material and bonded by solid **polymer ion exchange resin.**

ABEX EP 1217680 A2 UPTX: 20021113
EXAMPLE - Denka Black (RTM) (carbon black) (in weight percent) (65) and polytetrafluoroethylene (PTFE) (35) were used to prepare an aqueous dispersion. The dispersion was coagulated, dried and naphtha was added as a lubricant. The lubricated coagulum was extruded to form a tape. The extruded tape was calendered, uniaxially stretched at 250degreesC and again calendered to produce a porous electrically-conductive gas permeable electrode sheet. The electrode sheet had a nominal pore size of 1 microm and a pore volume of 78%. A collector sheet impregnated with an aqueous dispersion of PTFE, and gas diffusion electrode sheet were laminated together and laminated assembly was heat-treated. A liquid mixture comprising Vulcan XC72 (RTM) (platinum-coated carbon black) (5g) and 2-methyl,1-propyl alcohol (4 g) was prepared. Isopropyl alcohol containing Nafion (RTM) (solid polymer ion exchange resin) (25) was added to prepared liquid mixture. The liquid mixture was applied to the electrode sheet. A porous expanded PTFE film was fixed on the coated electrode sheet. The PTFE film was coated with isopropyl alcohol containing Nafion (RTM) (5) to fill the pores. The composite assembly was heat-treated at 130degreesC for 24 hours and an unitary assembly was obtained. The obtained assembly was mounted and operated as a gaseous fuel cell. Humidified hydrogen and oxygen were fed on one and other sides of the assembly at 80degreesC. The cell developed a voltage of 0.78 V at a current density of 1 A/cm2.

FS CPI EPI

FA AB
MC CPI: A04-E08; A12-E09; A12-M; A12-W11A; J03-B02; J03-B03; L03-E01A; L03-E04G
EPI: X16-C01C; X16-C16; X16-E06A; X16-F02; X25-R01A
PLE UPA 20021113
[1.1] 018; D01 D10-R D60 D69 F62 F- 7A; P0000; S9999 S1627 S1605
[1.2] 018; Q9999 Q7772; Q9999 Q6644-R
[1.3] 018; ND01; K9892; K9416; K9676-R; K9574 K9483; K9483-R; B9999 B5141 B4740; Q9999 Q8060; Q9999 Q7396 Q7330; Q9999 Q7409 Q7330; Q9999 Q7341 Q7330; Q9999 Q7410 Q7330; B9999 B3269 B3190; K9621-R; B9999 B4091-R B3838 B3747; N9999 N7090 N7034 N7023; N9999 N7147 N7034 N7023; B9999 B5447 B5414 B5403 B5276; N9999 N6177-R; N9999 N7192 N7023; Q9999 Q7818-R; B9999 B4886 B4853 B4740
[1.4] 018; R00271 D01 D11 D10 D50 D83 F27 F26; A999 A475
[2.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; S9999 S1309-R; S9999 S1285-R; S9999 S1650 S1649; S9999 S1025 S1014; P0511
[2.2] 018; B9999 B5221 B4740; B9999 B5243-R B4740; N9999 N6699 N6655; N9999 N6780-R N6655; N9999 N5970-R; N9999 N6940 N6939; N9999 N5936 N5914; B9999 B5174 B5152 B4740; K9723; N9999 N6086
[2.3] 018; ND01; K9892; K9416; K9676-R; K9574 K9483; K9483-R; B9999 B5141 B4740; Q9999 Q8060; Q9999 Q7396 Q7330; Q9999 Q7409 Q7330; Q9999 Q7341 Q7330; Q9999 Q7410 Q7330; B9999 B3269 B3190; K9621-R; B9999 B4091-R B3838 B3747; N9999 N7090 N7034 N7023; N9999 N7147 N7034 N7023; B9999 B5447 B5414 B5403 B5276; N9999 N6177-R; N9999 N7192 N7023; Q9999 Q7818-R; B9999 B4886 B4853 B4740
[2.4] 018; A999 A340-R
[2.5] 018; R05085 D00 D09 C- 4A; A999 A135

L100 ANSWER 4 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-229877 [29] WPIX
DNN N2002-176823 DNC C2002-069911
TI Membrane-**electrode** assembly used in **fuel cells**, includes fluor-containing **cation exchange membrane**, porous **electrode** material layers, electroconductive inactive material, and fluorpolymeric binder.
DC A14 A35 A85 E36 J03 L03 X16
IN SEHLIN, S R; SPRENKLE, V L
PA (LITO) LITTON SYSTEMS INC; (NOTH) NORTHROP GRUMMAN CORP
CYC 30
PI EP 1176656 A2 20020130 (200229)* EN 19p H01M008-12
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
CA 2352689 A1 20020126 (200229) EN C25B011-00

JP 2002129370 A 20020509 (200234) 9p C25B011-04
US 6383350 B1 20020507 (200235) C25B011-00
US 2002060148 A1 20020523 (200239) H01M008-10
KR 2002009448 A 20020201 (200254) C25B011-02

ADT EP 1176656 A2 EP 2001-116576 20010709; CA 2352689 A1 CA 2001-2352689 20010709; JP 2002129370 A JP 2001-215011 20010716; US 6383350 B1 US 2000-626794 20000726; US 2002060148 A1 Div ex US 2000-626794 20000726, US 2001-357 20011204; KR 2002009448 A KR 2001-43873 20010720

PRAI US 2000-626794 20000726; US 2001-357 20011204

IC ICM C25B011-00; C25B011-02; C25B011-04; H01M008-10; H01M008-12
ICS A61M016-10; B01J023-26; B01J023-34; B01J023-78; B01J023-86; B01J023-889; B01J035-04; B01J037-02; C23C028-00; C23C030-00; C25B009-00; C25B011-03; H01M004-86; H01M004-90; H01M004-96; H01M008-24

AB EP 1176656 A UPAB: 20020508

NOVELTY - A membrane-**electrode** assembly (MEA) comprises a fluor-containing **cation exchange membrane**, porous **electrode** material layers, electroconductive inactive material, and fluorpolymeric binder. The fluor-containing **cation exchange membrane** is produced of hydrolyzed copolymer of tetrafluoroethylene with perfluorosulfur-containing vinyl ether.

DETAILED DESCRIPTION - A membrane-**electrode** assembly (MEA) comprises a fluor-containing **cation exchange membrane**, porous **electrode** material layers (made of electrocatalyst), electroconductive inactive material, and fluorpolymeric binder situated on both surfaces of **cation exchange membrane**. The fluor-containing **cation exchange membrane** is produced of hydrolyzed copolymer of tetrafluoroethylene with perfluorosulfur-containing vinyl ether (EW = 900-1300), which has a degree of crystallinity of 2-8%. The porous **electrode** material layers are produced with porosity 40-70%, that decreases in the direction of **cation exchange membrane** surface with gradient of porosity of 5-15 %/1 microns m.

An INDEPENDENT CLAIM is also included for the production of an MEA comprising applying a mixture of electrocatalyst and electroconducting inactive material with fluor-containing polymeric binder to both surfaces of **cation exchange membrane**. A mixture of electrocatalyst, electroconducting inactive material, and 1-5% solution of cation exchange fluorcopolymer identical to fluorcopolymer which **cationic exchange membrane** is produced of in organic solvents mixture is applied. Heat-treating is carried out with multi-stage increase of the temperature at 20-35 deg. C to 80-100 deg. C.

USE - Used in **fuel cells**, in water electrolyzers, and other electrochemical processes.

ADVANTAGE - The MEA has an improved electrochemical characteristics such as low catalyst loading, increase in efficiency of electrocatalyst usage and life time.

Dwg.0/0

TECH EP 1176656 A2 UPTX: 20020508

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Component: The **electrode** material porous layers are produced of mixture containing (mass %) electrocatalyst (20-85), electroconductive inactive material (10-60), cation exchange fluorcopolymer identical to fluorcopolymer from which **cation exchange membrane** is produced, and **polytetrafluoroethylene** (3-15). The **electrode** material porous layers can also be produced from a mixture of electrocatalyst (65-95), and electroconducting inactive material cationic-exchange fluorcopolymer (1-35, preferably 1-9) identical to fluorcopolymer which **cationic-exchange membrane** is produced of.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Component: The fluor-containing **cation exchange membrane** can be ethylene, perfluor-2-methylen-4-methyl-1,3-dioxalan, or perfluoroalkyled vinyl ester with 1-3C alkyl.

ABEX EP 1176656 A2 UPTX: 20020508

EXAMPLE - Electrocatalyst (platinum) (0.24 g) deposited on the surface of inactive electroconductive material (acetylene black) (0.58 g), were mixed with polytetrafluoroethylene (0.1 g) and fluorocopolymer (CPL-1) (0.08 g) as a 3% solution in the mixture of ethanol, freon-13, and methyl ethyl ketone. The obtained viscous compound was applied to a cation exchange membrane (CEM). The CEM was heated, cooled at room temperature. The produced MEA contained CEM of CPL-1 (170 microns thick) with the layers of an electrode material situated on both sides. The general porosity was 40%, with the porosity gradient 5%/1 microns. The produced MEA was tested at a fuel cell. The fuel cell was operating stable for 3000 hours, and the exfoliation of the electrode material layer was not observed by visual survey. When the MEA was returned into the fuel cell, its parameters did not change.

KW [1] 97153-0-0-0 CL PRD; 217-0-0-0 CL PRD

FS CPI EPI

FA AB; DCN

MC CPI: A04-E10; A10-E09; A12-E06; A12-E06B; A12-E09; E11-S; E31-A02; E31-D01; J03-B03A; L03-E04A2; L03-E04B

EPI: X16-C01; X16-E06A

DRN 1532-P; 1532-U; 1779-P; 1779-U

PLE UPA 20020508

[1.1] 018; P0500 F- 7A; K9643 K9621

[1.2] 018; H0022 H0011; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58 D82; G0806 G0022 D01 D51 D53 D11 D10 D23 D22 D75 D31 D46 D59 D69 D85 F24 F- 7A; H0293; K9643 K9621; P1150

[1.3] 018; G0577 G0566 G0022 D01 D12 D10 D51 D53 D58 D63 F41 F89 D11 D69 D83 D84 D85 F- 7A; H0000; H0011-R; K9643 K9621

[1.4] 018; H0022 H0011; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; G0806 G0022 D01 D51 D53 D12 D10 F34 D69 F- 7A; K9643 K9621; M9999 M2313

[1.5] 018; H0000; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; P0511

[1.6] 018; ND01; Q9999 Q6791; Q9999 Q7410 Q7330; Q9999 Q8060; Q9999 Q7772; B9999 B4795 B4773 B4740; Q9999 Q7409 Q7330; B9999 B5221 B4740

CMC UPB 20020508
M3 *01* C101 C550 C810 M411 M424 M720 M740 M904 M905 N120 N209 N262 N512 N513 N514 Q130 Q454
DCN: R01532-K; R01532-P
M3 *02* C108 C550 C810 M411 M424 M720 M740 M904 M905 M910 N120 N209 N262 N512 N513 N514 Q130 Q454
DCN: R01779-K; R01779-P

L100 ANSWER 5 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1994-069284 [09] WPIX
CR 1994-069283 [09]
DNN N1995-097741 DNC C1995-056429
TI Prodn. of **electrode** assemblies for solid polymer electrolyte **fuel cells** - using copolymer membrane contg. perfluoro sulphonic acid gp. and binder.
DC A14 A18 A85 L03 X16
IN HARADA, H
PA (CHLR) CHLORINE ENGINEERS CORP LTD
CYC 2
PI JP 06020710 A 19940128 (199409)* 9p H01M008-02
US 5399184 A 19950321 (199517)B 12p H01M008-10
JP 3492385 B2 20040203 (200410) 8p H01M008-02
ADT JP 06020710 A JP 1992-174480 19920701; US 5399184 A US 1993-54294 19930430; JP 3492385 B2 JP 1992-174480 19920701
FDT JP 3492385 B2 Previous Publ. JP 06020710
PRAI JP 1992-174480 19920701; JP 1992-112879 19920501; JP 1992-145515 19920605
IC ICM H01M008-02; H01M008-10
ICS H01M008-10
AB US 5399184 A UPAB: 19950508 ABEQ treated as Basic
Electrode assembly for solid polymer electrolyte **fuel cells** comprising a **cation exchange membrane** with an **electrode** catalyst layer and a C cloth or paper layer on each surface is

fabricated by: (a) prepg. a **cation exchange membrane** comprising a perfluorosulphonic acid group-contg. copolymer comprising TFE units and perfluorovinyl ether units with side chains carrying sulphonic acid gps. and having formulae (I) or (II): X = H, Na or K; k = 2.1-7.6; m = 3.8-9.3; and l and n = positive integers; the membrane having thickness 50-100 microns in the dry state at room temp. and an ion exchange capacity of 1.12 to 1.43 meq/g (dry resin); and (b) bonding the **electrode** catalyst layers and the C cloth or paper layers on both surfaces of the membrane by: (i) prepg. a uniform mixt. of **electrode** catalyst supported on fine C particles and a **PTFE** dispersion; (ii) applying the mixt. to a sheet of electroconductive and gas-permeable C cloth or paper and hot pressing, forming an **anode**; (iii) repeating step (ii) to obtain another sheet having an **electrode** catalyst layer, applying a mixt. contg. fine C and a **PTFE** dispersion to the opposite side and hot pressing to form a **cathode** having the **electrode** catalyst **layer** and a **water-repellent layer** formed from the layer of fine C particles/**PTFE**; (iv) prepg. a soln. or dispersion of perfluorosulphonic acid copolymer (I) or (II) (X representing the same element as X in the **cation exchange membrane copolymer**); (v) applying this to the surfaces of the **electrode** catalyst layers and/or of the membrane; (vi) stacking the membrane and the C cloth or paper sheets; and (vii) hot pressing at a temp. at least 10 deg. C lower than the softening pt. of the perfluorosulphonic acid copolymer to give the **electrode** assembly.

USE - In the prodn. of proton exchange membrane **fuel cells** (PEMFCs).

ADVANTAGE - The method provides **electrode** assemblies for PEMFCs with high cell voltage and efficiency.

Dwg.0/1

AB JP 06020710 A UPAB: 20040210

Dwg.0/1

FS CPI EPI

FA AB; GI

MC CPI: A04-A; A04-E10; A12-E06A; L03-E04B; A04-E09; A04-E10C; A12-E06B; A12-M04

EPI: X16-E06A; X16-C01

L100 ANSWER 6 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1994-069283 [09] WPIX

CR 1994-069284 [09]

DNN N1995-097741 DNC C1995-056429

TI Prodn. of **electrode** assemblies for solid polymer electrolyte **fuel cells** - using copolymer membrane contg. perfluoro sulphonic acid gp. and binder.

DC A14 A18 A85 L03 X16
IN HARADA, H
PA (CHLO-N) CHLORINE ENGINEERS CORP; (CHLR) CHLORINE ENGINEERS CORP; (CHLR) CHLORINE ENGINEERS CORP LTD
CYC 2
PI JP 06020709 A 19940128 (199409)* 7p H01M008-02
US 5399184 A 19950321 (199517)B 12p H01M008-10
JP 3378028 B2 20030217 (200316) 7p H01M004-88
ADT JP 06020709 A JP 1992-145515 19920605; US 5399184 A US 1993-54294 19930430; JP 3378028 B2 JP 1992-145515 19920605
FDT JP 3378028 B2 Previous Publ. JP 06020709
PRAI JP 1992-112879 19920501; JP 1992-174480 19920701
IC ICM H01M004-88; H01M008-02; H01M008-10
ICS C08J005-22
AB US 5399184 A UPAB: 19950508 ABEQ treated as Basic

Electrode assembly for solid polymer electrolyte **fuel cells** comprising a **cation exchange membrane** with an **electrode** catalyst layer and a C cloth or paper layer on each surface is fabricated by: (a) prepg. a **cation exchange membrane** comprising a perfluorosulphonic acid group-contg. copolymer comprising TFE units and perfluorovinyl ether units with side chains carrying sulphonic acid gps. and having formulae (I) or (II): X = H, Na or K; k = 2.1-7.6; m = 3.8-9.3; and l and n = positive integers; the membrane having thickness 50-100 microns in the dry state at room temp. and an ion exchange capacity of 1.12 to 1.43 meq/g (dry resin); and (b) bonding the **electrode** catalyst layers and the C cloth or paper layers on both surfaces of the membrane by: (i) prepg. a uniform mixt. of **electrode** catalyst supported on fine C particles and a **PTFE** dispersion; (ii) applying the mixt. to a sheet of electroconductive and gas-permeable C cloth or paper and hot pressing, forming an **anode**; (iii) repeating step (ii) to obtain another sheet having an **electrode** catalyst layer, applying a mixt. contg. fine C and a **PTFE** dispersion to the opposite side and hot pressing to form a **cathode** having the **electrode** catalyst **layer** and a **water-repellent layer** formed from the layer of fine C particles/**PTFE**; (iv) prepg. a soln. or dispersion of perfluorosulphonic acid copolymer (I) or (II) (X representing the same element as X in the **cation exchange membrane copolymer**); (v) applying this to the surfaces of the **electrode** catalyst layers and/or of the membrane; (vi) stacking the membrane and the C cloth or paper sheets; and (vii) hot pressing at a temp. at least 10 deg. C lower than the softening pt. of the perfluorosulphonic acid copolymer to give the **electrode** assembly.

USE - In the prodn. of proton exchange membrane **fuel**

cells (PEMFCs).

ADVANTAGE - The method provides **electrode** assemblies for PEMFCs with high cell voltage and efficiency.

Dwg.0/1

AB JP 06020709 A UPAB: 20040210

Prepn. method comprises forming to **electrode** catalyst layer on **cation exchange membrane** by applying and hot-pressing the mixt. of **electrode** catalyst substance and binder on the **membrane.** In the method, **cation exchange membrane** of 50-150 microns in thickness in dry state at room temp., and having ion exchange capacity of 0.83-1.43 milli-equivalent/g (dry resin), which consists of copolymer having perfluorosulphonic acid group of the following formulae (1) or (2) composed of tetrafluoroethylene units and perfluorovinylether units having sulphonic acid group in its side chain, where x=Na or K, k=approx. 2.1-approx.7.4, m=approx. 3.8-9.1, and 1 and n=positive number, are used.

In forming the **electrode** catalyst layer, carbon fine particle coated with Pt catalyst, and soln. consisting of lower alcohol in which perfluorosulphonic acid copolymer having the structure of the formulae (1) and (2), where X=h, is dissolved, are uniformly mixed to prepare mixt.. Then perfluorosulphonic copolymer in the mixt. is modified to K type if the sulphonic acid gp. of the **cation exchange membrane** is K type, or modified to Na type if the same is Na type, then the mixt. is uniformly applied on one or both surfaces of the **cation exchange membrane.** The applied mixt. shall be dried at room temp. or immediately after applied, it is dried at reduced pressure at up to 30 mmHg at room temp. to remove the solvent in the mixture. Then the material is hot-pressed at the temp. at least 10 deg.C lower than the softening pt. of the K type or Na type perfluorosulphonic acid copolymer of the membrane to make the **electrode** catalyst layer attached and bonded well to the **cation exchange membrane.** The **membrane** bonded with the catalyst layer is soaked in dil. H2SO4 or dil.HCl aq. soln. to modify entire body to H type.

USE/ADVANTAGE - The method is used for prepn. of the gas diffusion **electrode** of the proton exchange membrane **fuel cell.** Bonding condition between the **cation exchange membrane** and the **electrode** catalyst layer can be improved. Resistance of it can be improved.

Dwg.1/1

FS CPI EPI

FA AB; GI

MC CPI: A04-A; A04-E09; A04-E10C; A11-B09A2; A12-E09; A12-M04; A12-W11A; L03-E04B; A12-E06B

EPI: X16-E06A; X16-C01

DRN 1704-U; 1714-U
PLC UPA 20040210
KS: 0037 0041 0044 0047 0050 0053 0167 0170 0203 0207 0209 0210 0229
0231 0949 0970 2001 2022 2198 2207 2318 2336 2371 2386 2393 2413
2427 2437 2488 2492 2507 2654 2667 2718 2739 2743 3264 3270

FG: *001* 017 03- 034 04- 05- 06- 062 063 064 075 08& 087 09& 09-
090 10& 10- 17& 19- 20& 230 231 250 27& 359 387 428 431
443 446 465 477 51& 54& 546 575 596 60- 604 608 623 624
627 642 722 724
FG: *002* 017 03- 034 04- 05- 06- 062 063 064 075 08& 087 09& 09-
090 10& 10- 17& 19- 20& 230 231 24- 250 27& 316 332 359
387 392 398 402 408 409 414 428 431 443 446 465 546 60-
623 627 722 724
PLE UPA 20040210
[1.1] H0022 H0011; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82
F- 7A; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F-
7A D61-R D84 D87 F62 Na 1A K-; M9999 M2835; L9999 L2391;
L9999 L2835
[1.2] ND01; ND07; Q9999 Q7410 Q7330; Q9999 Q7409 Q7330; K9370;
N9999 N7147 N7034 N7023; N9999 N6177-R; N9999 N6600; K9574
K9483; K9687 K9676; K9698 K9676; K9712 K9676; N9999
N5721-R
[1.3] B9999 B5243-R B4740; Q9999 Q7772; Q9999 Q8060; B9999 B5447
B5414 B5403 B5276; B9999 B5629 B5572
[1.4] R01704 D00 D60 H- Cl 7A; R01714 D00 D60 H- O- 6A S-; H0226
[2.1] H0022 H0011; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82
F- 7A; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F-
7A D84 D60 D87 F62; L9999 L2391; L9999 L2379-R; M9999
M2379-R; S9999 S1627 S1605; M9999 M2835; L9999 L2835
[2.2] ND01; ND07; Q9999 Q7410 Q7330; Q9999 Q7409 Q7330; K9370;
N9999 N7147 N7034 N7023; N9999 N6177-R; N9999 N6600; K9574
K9483; K9687 K9676; K9698 K9676; K9712 K9676; N9999
N5721-R
[2.3] N9999 N7090 N7034 N7023; N9999 N6780-R N6655; N9999 N6860
N6655; K9654; N9999 N6439
[2.4] Na 1A K-; H0157
[2.5] R01704 D00 D60 H- Cl 7A; R01714 D00 D60 H- O- 6A S-; H0226
[2.6] D01 F26-R; A999 A475

L100 ANSWER 7 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1992-259527 [32] WPIX
DNN N1992-198678 DNC C1992-115918
TI Hydrophobic, porous, conductive material for **fuel cell electrode** - comprising carbon fibre paper impregnated with hydrophobic PTFE.
DC A85 L03 X16
IN DIRCKS, K W; EPP, D G; WATKINS, D S

PA (MIND) CANADA MIN NAT DEFENCE
CYC 1
PI CA 2052221 A 19920520 (199232)* 23p H01M004-94
CA 2052221 C 20000411 (200035) EN H01M004-94
ADT CA 2052221 A CA 1991-2052221 19910925; CA 2052221 C CA 1991-2052221 19910925
PRAI US 1990-615362 19901119
IC ICM H01M004-94
AB CA 2052221 A UPAB: 19931006
A hydrophobic porous electrically conductive material comprises (a) conductive sheet material, pref. carbon fibre paper; and (b) a hydrophobic polymer impregnated in (a). The ratio of (b) to (a) is 2-14 (pref. 6) wt. %. also claimed are (1) a composite **electrode** consisting of a catalytic material deposited on (a); the material being platinum and a PTFE binder; (2) a **membrane electrode** in which **anion exchange membrane** electrolyte is placed between an **anode** and a **cathode**. Either **anode** or **cathode** is composed of (a) with the described catalytic material deposited on it; (3) a membrane **electrode** in which the **ion exchange membrane** electrolyte is positioned between a pair o sheets having catalytic material deposited on them and being impregnated with described polymer. The ratio by wt. of polymer to sheet material is greater on the **anode** than **cathode**; and (4) an electrochemical **fuel cell** consisting of a membrane **electrode** in which the **cathode** is a composite **electrode**. Pref. (b) is **PTFE**.
USE/ADVANTAGE - For electrochemical **fuel cell** . Membrane **electrodes** can be constructed with thin membranes to obtain max. cell efficiency, but still providing enough strength for the assembly due to the increased TEFLON (RTM: **PTFE**) loading on the **anode**.
1/4
FS CPI EPI
FA AB; GI
MC CPI: A04-E08; A12-E06A; L03-E04B
EPI: X16-E06A
PLC UPA 20000725
KS: 0210 0231 0947 2488 2492 2682 2723 2739 3251

FG: *001* 014 04- 062 064 087 440 446 465 477 53& 532 533 535 60-609 623 627 688

L100 ANSWER 8 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1968-75867P [00] WPIX
TI Ptfe binder for **fuel cell electrodes**.
DC A00

PA (GENE) GENERAL ELECTRIC CO
CYC 2
PI US 3297484 A (196800)*
NL 132907 B (197130)
PRAI US 1961-108418 19610508
AB US 3297484 A UPAB: 19930831
Gaseous **fuel cell** contng. (i) a pair of gas-permeable, hydrophobic, electronically conductive **electrode** elements composed of gas adsorbing metal particles bonded together into a unitary mass with PTFE in a 0.2-2.5 vol. ratio of metal particles to PTFE, the metal particles being pref. of Pt or Pd, and (ii) an aq. electrolyte soln. sorbed in a solid matrix which may be an **ion-exchange resin membrane.**
The specified **electrode** structures can be produced in relatively thin films, thereby increasing the efficiency and lowering the cost of the cell.
FS CPI
FA AB
MC CPI: A04-E08; A12-E
PLC UPA 19930924
FG: *001* 01& 062 064 087 446 609 623 627 688 720 722

=> file japio
FILE 'JAPIO' ENTERED AT 15:06:10 ON 06 APR 2004
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FILE LAST UPDATED: 1 MAR 2004 <20040301/UP>
FILE COVERS APR 1973 TO NOVEMBER 28, 2003

=> d l103 1-10 ibib abs ind

L103 ANSWER 1 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2003-308847 JAPIO
TITLE: METHOD OF MANUFACTURING **ELECTRODE** FOR **FUEL CELL**, COATING COMPOSITION AND METHOD OF MANUFACTURING IT
INVENTOR: HIRABAYASHI SACHIKO; MIYAKOSHI TOSHINOBU
PATENT ASSIGNEE(S): TDK CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003308847	A	20031031	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 2002-111113 20020412
ORIGINAL: JP2002111113 Heisei
PRIORITY APPLN. INFO.: JP 2002-111113 20020412
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003

AN 2003-308847 JAPIO

AB PROBLEM TO BE SOLVED: To provide a method of manufacturing an **electrode** for a **fuel cell**, capable of simplifying the number of processes while excellently keeping a dispersion condition of **polytetrafluoroethylene** (**PTFE**) particles in **electrode** slurry.
SOLUTION: An adjusting process to adjust the **electrode** slurry by dispersing a solid content containing at least either one of a catalyst component or a carbon particle and a polytetrafluoroethylene component in water serving as a dispersion medium, so that the ratio of the solid content to water (weight ratio) is kept in a range of 1 <= water/solid content <= 10, a viscosity adjusting process to add a polycarboxylic acid based surface active agent to the **electrode** slurry adjusted in the adjusting process, an applying process to apply the **electrode** slurry to which the polycarboxylic acid based surface active agent is added to a base material, and a thermally molding process to thermally pressurize the solid content after removing the dispersion medium are provided. The viscosity of the **electrode** slurry can be controlled to any optional range by changing the amount of the polycarboxylic acid based surface active agent to be added.

IC ICM H01M004-88
ICS H01M004-86
ICA H01M008-10

L103 ANSWER 2 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2000-228206 JAPIO
TITLE: **ELECTRODE** FOR **FUEL CELL** AND MANUFACTURE THEREOF
INVENTOR: HITOMI SHUJI
PATENT ASSIGNEE(S): JAPAN STORAGE BATTERY CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000228206	A	20000815	Heisei	H01M004-96

APPLICATION INFORMATION
STN FORMAT: JP 1999-29045 19990205
ORIGINAL: JP11029045 Heisei

PRIORITY APPLN. INFO.: JP 1999-29045 19990205
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-228206 JAPIO
AB PROBLEM TO BE SOLVED: To form a gas diffusion **layer** having high **water repellency** and high gas diffusibility at the same time, and attain a high performance of an **electrode** by providing a conductive porous body containing porous polymer obtained by fluoridizing porous fluororesin. SOLUTION: This **electrode** for a **fuel cell** includes a porous catalyst layer 36 containing catalyst particles 31, a solid high polymer electrolyte 32, and pores 34. The porous catalyst layer 36 is so constituted that catalyst particles 31 and solid high polymer electrolyte 32 are mixed with each other to be distributed in three dimensions, and plural pores 34 are formed in the interior. A gas diffusion layer 38 is formed by a perforated polymer 39 obtained by fluoridizing a porous fluororesin and a conductive porous body 37. Further, the layer contains **PTFE** particles 33 and an **ion exchange membrane** 35. The porous polymer 39 obtained by fluoridizing the porous fluororesin maybe disposed all over the conductive porous body, or may be partly disposed only on the surface layer or only on one face. COPYRIGHT: (C)2000,JPO
IC ICM H01M004-96
ICS H01M004-88

L103 ANSWER 3 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1998-302807 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** OF **FUEL CELL** BY MIXING METHOD OF COATING AND ROLLING
INVENTOR: RAKU HYUN SON; DON RYURU SHIN; CHAN SUU KIM; BYUN ROKU LEE
PATENT ASSIGNEE(S): KOREA INST OF ENERG RES
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10302807	A	19981113	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 1998-58490 19980310
ORIGINAL: JP10058490 Heisei
PRIORITY APPLN. INFO.: KR 1997-14351 19970418
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1998

AN 1998-302807 JAPIO

AB PROBLEM TO BE SOLVED: To provide the manufacturing method of an **electrode** of a **fuel cell** in combination with a coating method and a rolling method. SOLUTION: Carbon paper is waterproofed to manufacture an **electrode** support. A solvent is added to carbon powder into which platinum is dispersed and stirred, PTFE (polytetrafluoroethylene) is added thereto so that the content of the **PTFE** in an **electrode** catalyst layer becomes 40-50 wt.% then a crosslinking agent and a peptization agent are added and stirred to produce catalyst layer slurry for coating. The slurry is uniformly applied to the **electrode** support in uniform thickness to form an **electrode** to which an **electrode** catalyst layer is uniformly applied. The **electrode** is dried in an inert gas atmosphere for 30 minutes to remove the solvent within the catalyst layer, the **electrode** dried is passed through a rolling device for rolling, then sintered in an inert gas atmosphere at 330-370°C for 30 minutes.

IC ICM H01M004-88

L103 ANSWER 4 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1998-208757 JAPIO
TITLE: **FUEL CELL** GENERATING SET
INVENTOR: MIYATA YASUSHI
PATENT ASSIGNEE(S): FUJI ELECTRIC CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10208757	A	19980807	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1997-7081 19970120
ORIGINAL: JP09007081 Heisei
PRIORITY APPLN. INFO.: JP 1997-7081 19970120
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1998
AN 1998-208757 JAPIO
AB PROBLEM TO BE SOLVED: To provide a **fuel cell** which supplies electric energy by directly introducing a mixed fluid in which an oxidizing agent and a reducing agent are mixed and for which industrial exhaust gases and waste liquids can be used. SOLUTION: A matrix 2 retaining phosphoric acid is installed adjacently to a **cathode** 1 produced by forming a gas diffusion **electrode** from gold active only to an oxidizing agent fluid and PTFE(**polytetrafluoroethylene**) and impregnating the **electrode** with phosphoric acid and to an

anode 3 produced by forming a gas diffusion **electrode** from tin active only to a reducing agent fluid and **PTFE** and impregnating the **electrode** with phosphoric acid, and a mixed fluid of the oxidizing agent fluid and the reducing agent fluid is introduced to obtain electric energy between the **cathode** 1 and the **anode** 3.
COPYRIGHT: (C)1998,JPO
IC ICM H01M008-02
ICS H01M004-90; H01M008-04

L103 ANSWER 5 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1998-055807 JAPIO
TITLE: AIR **ELECTRODE** FOR **FUEL CELL** AND MANUFACTURE THEREOF
INVENTOR: KUWAHA KOUICHI; MATSUOKA AKIRA
PATENT ASSIGNEE(S): AISIN SEIKI CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10055807	A	19980224	Heisei	H01M004-90

APPLICATION INFORMATION
STN FORMAT: JP 1996-227754 19960808
ORIGINAL: JP08227754 Heisei
PRIORITY APPLN. INFO.: JP 1996-227754 19960808
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1998
AN 1998-055807 JAPIO
AB PROBLEM TO BE SOLVED: To improve the air utilization factor by forming an **electrode** of a gas diffused layer and catalyst layers formed on the surface of the gas diffused layer, and forming the catalyst **layer** of conductive grains, **water repellent** grains, high molecular electrolyte, main catalyst and auxiliary catalyst.
SOLUTION: A hydrogen **electrode** 11 and an air **electrode** 12 of a **fuel cell** 1 are respectively formed of a gas diffused layer 14 and catalyst layers 15, 16 formed on the surface of the gas diffused layer. The catalyst layer 16 of the air **electrode** 12 is formed of carbon black as conductive grains 160, **PTFE** as water repellent grains 163, positive **ion exchange resin** as high molecular electrolyte 164, granular platinum as main catalyst 161 and vanadium oxide as auxiliary catalyst 162. The catalyst layer 15 of the hydrogen **electrode** 11 is formed of carbon black as conductive grains 160, granular platinum carried by the carbon black, **PTFE** as water repellent grains 163 and positive **ion exchange resin** as high molecular

electrolyte 164. The gas diffused layer 14 of the **electrodes** 11, 12 is formed of a carbon fiber plate formed by laminating carbon fibers 140.
COPYRIGHT: (C)1998,JPO
IC ICM H01M004-90
ICS B01J023-42; H01M004-88; H01M004-92

L103 ANSWER 6 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1995-078617 JAPIO
TITLE: GAS DIFFUSION **ELECTRODE** AND MANUFACTURE THEREOF
INVENTOR: MORIGA TAKUYA; HIRATA ISAO; KAHATA TATSUO; TANI TOSHIHIRO
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07078617	A	19950320	Heisei	H01M004-96

APPLICATION INFORMATION
STN FORMAT: JP 1993-224218 19930909
ORIGINAL: JP05224218 Heisei
PRIORITY APPLN. INFO.: JP 1993-224218 19930909
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995
AN 1995-078617 JAPIO
AB PURPOSE: To provide a gap diffusion **electrode** for solid polymer electrolyte **fuel cell** and the manufacture thereof.
CONSTITUTION: A gas diffusion **electrode** for stolid polymer electrolyte **fuel cell** has a sheet-shaped gas diffusion layer prepared by mixing carbon fibers to water repellent carbon black and polytetrafluoroethylene, and a reaction layer comprising hydrophilic carbon black arranged on the gas diffusion layer, water repellent carbon black, and **polytetrafluoroethylene.** The gas diffusion **electrode** is manufactured by pressing the sheet-shaped reaction layer against the gas diffusion layer in a hot-press process, or by applying a slurry-state reaction layer material to the gas diffusion layer, drying, and baking.
COPYRIGHT: (C)1995,JPO
IC ICM H01M004-96
ICS H01M004-88

L103 ANSWER 7 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1994-020710 JAPIO
TITLE: MANUFACTURE OF GAS DIFFUSION **ELECTRODE**

FOR **FUEL CELL**
INVENTOR: HARADA HIROYUKI
PATENT ASSIGNEE(S): CHLORINE ENG CORP LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06020710	A	19940128	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1992-174480 19920701
ORIGINAL: JP04174480 Heisei
PRIORITY APPLN. INFO.: JP 1992-174480 19920701
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994

AN 1994-020710 JAPIO
AB PURPOSE: To efficiently make a gas diffusion **electrode** by junctioning a specified **anode** ion exchange film with carbon cloth covered with **electrode catalyst**, using the **anode** ion exchange film which has a specified thickness and specified ion exchange capacity.
CONSTITUTION: A parfluosulfonic acid **copolymer** **anode ion exchange** film 1 has the structure shown by formulae I and II. But, X is H, Na or K, k is 2.1-7.6, m is 3.8-9.3, and l and n are positive numbers. This has a specified thickness at room temperature, and the surface of the film has specified ion exchange capacity. On one side of the exchange film, an **electrode catalyst** layer 3 is made to serve as an **anode** by covering the surface of conductive and gas transmitting carbon cloth with a mixture consisting of carbon particles bearing **electrode catalysts** and **polytetrafluoroethylene** dispersed liquid, and compression-bonding them. A **water-repellent** **layer** is provided similarly to serve as a **cathode** by covering the opposite side of the carbon cloth 4 provided with an **electrode catalyst** layer 2 with a mixture consisting of carbon particles and **polytetrafluoroethylene** dispersed liquid, and compression-bonding them.

IC ICM H01M008-02
ICS H01M008-10

L103 ANSWER 8 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1986-185866 JAPIO
TITLE: **FUEL CELL**
INVENTOR: MAOKA TADANORI; UENO SANJI
PATENT ASSIGNEE(S): TOSHIBA CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 61185866	A	19860819	Showa	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1985-26752 19850214
ORIGINAL: JP60026752 Showa
PRIORITY APPLN. INFO.: JP 1985-26752 19850214
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1986

AN 1986-185866 JAPIO
AB PURPOSE: To improve performance and obtain durability in long running by forming a water repellent processing portion on a surface opposite to the surface on which gas flow path is formed in an **electrode** with rib and forming hydrophilic processing portion on the part except for the water repellent processing portion and by coating catalyst only on the water repellent processing portion.
CONSTITUTION: A portion on which no water repellent processing is applied is provided in the intersecting direction with a gas flow path on a surface opposite to the surface on which the gas flow path of a porous **electrode** body with rib so as to perform water repellent processing selective and partially without damaging retaining function of electrolyte. Next, the portion except the portion without water repellent processing is applied water repellent processing with thickness corresponding to a rib remaining thickness to form a water repellent processing portion 9. And hydrophilic processing is applied with thickness corresponding to at least the rib remaining thickness to the portion on which water repellent processing in the **electrode** body with rib which is applied partial water repellent processing is not applied to form a water repellent processing portion 10. After drying the **electrode** with rib, carbon carrying platinum catalyst is applied only to the water repellent processing portion, and the portion is applied thermal processing to sinter **teflon** and the **electrode** with rib 8 is obtained.

IC ICM H01M004-86
ICS H01M008-02

L103 ANSWER 9 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1983-166638 JAPIO
TITLE: **FUEL CELL**
INVENTOR: IMAHASHI JINICHI; ISHII KENZO; TAKEUCHI SEIJI; KAHARA TOSHIKI; HONCHI AKIO; MATSUDA SHINPEI
PATENT ASSIGNEE(S): HITACHI LTD
HITACHI CHEM CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 58166638	A	19831001	Showa	H01M004-86

APPLICATION INFORMATION

STN FORMAT:	JP 1982-49495	19820327
ORIGINAL:	JP57049495	Showa

PRIORITY APPLN. INFO.: JP 1982-49495 19820327
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1983

AN 1983-166638 JAPIO
AB PURPOSE: To both improve wetness with phosphoric acid and obtain high performance of an **electrode** plate, by forming a **water repellent** of a **catalytic layer** to two layers in an **electrode** plate having an **electrode catalytic** layer consisting of an **electrode catalyst** and water repellent agent. CONSTITUTION: A mixture of, for instance, 3g **polytetrafluoroethylene** dispersion of **electrode catalyst** and water is kneaded and applied to conductive porous carbon paper then fired after drying to obtain an **electrode** plate, and a kneaded mixture of 1g **polytetrafluoroethylene** dispersion of **electrode catalyst** and water is applied to said **electrode** plate and fired after drying to form a two-layer **electrode catalytic** layer. In this way, wetness with phosphoric acid can be improved and performance of an **electrode** plate can be improved.

IC ICM H01M004-86

L103 ANSWER 10 OF 10 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1982-036785 JAPIO
TITLE: **FUEL CELL**
INVENTOR: ISHII KENZO; MATSUDA SHINPEI; TAMURA KOKI; ONO SEIICHIRO; TAKEUCHI MASAHITO; KAHARA TOSHIKI; TAKEUCHI SEIJI; OKADA HIDEO; IMAHASHI JINICHI; OKABE SHIGERU
PATENT ASSIGNEE(S): HITACHI LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 57036785	A	19820227	Showa	H01M008-08

APPLICATION INFORMATION

STN FORMAT: JP 1980-111641 19800815
ORIGINAL: JP55111641 Showa
PRIORITY APPLN. INFO.: JP 1980-111641 19800815
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1982

AN 1982-036785 JAPIO
AB PURPOSE: To enable a homogeneous matrix fully impregnated with electrolyte to be easily made, by placing spacers between a fuel **electrode** and an oxydant **electrode**, and filling the space formed by the spacers and the **electrodes** with a matrix material.
CONSTITUTION: Beltlike spacers 4a made of polytetrafluoroethylene are placed on a fuel **electrode** 5 at given intervals. A matrix material 4b prepared by mixing phosphoric acid with a binding agent such as silicon carbide or polytetrafluoroethylene is filled in a matrix part formed by spacers 4a and catalyst layers 3. After that, an oxydant **electrode** 6 is placed over the material 4b, and the **electrode** 6 is pressed by means of a roller, thereby making a homogeneous and continuous matrix 1 without any crack to be formed between the catalyst layers 3. The catalyst layer 3 is formed by applying a mixture consisting of platinum grains held by carbon black or acetylene black, and a binding agent such as **polytetrafluoroethylene** to an **electrode** base material 2 such as carbon paper, before the material 2 coated with the mixture is sintered.

IC ICM H01M008-08

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L104 ANSWER 1 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2003-242988 JAPIO
TITLE: MANUFACTURING METHOD OF **FUEL CELL ELECTRODE**
INVENTOR: MINEO TOKUICHI; KONUMA HIROSHI; KOMUKAI MASAHIRO
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003242988	A	20030829	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 2002-43986 20020220
ORIGINAL: JP2002043986 Heisei
PRIORITY APPLN. INFO.: JP 2002-43986 20020220
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined

Applications, Vol. 2003

AN 2003-242988 JAPIO

AB PROBLEM TO BE SOLVED: To manufacture each layer of the **fuel cell electrode** flatly with little roughness on the surface in the manufacturing process of the **fuel cell electrode** that is formed on the base material.
SOLUTION: This is a manufacturing method that comprises steps S01+S02+S03 for forming conductive **water-repellent layer** on one face of the collector for a **fuel cell electrode**, a step S04 for coating a slurry containing **electrode** particles and **ion exchange resin** particles on the surface of the conductive **water-repellent layer** as a reaction layer, a step S05 for holding horizontally the reaction layer 4' for a preset time at a first temperature as a preset temperature, a step S06 for drying the reaction layer 4' at a second temperature as a preset temperature.

IC ICM H01M004-88
ICS H01M004-92; H01M004-96

ICA H01M008-10

L104 ANSWER 2 OF 17 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2003-123776 JAPIO

TITLE: MANUFACTURING METHOD OF **ELECTRODE** FOR SOLID POLYMER **FUEL CELL**

INVENTOR: WATANABE SATORU; YASUTAKE SATONOBU; NOJIMA SHIGERU

PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003123776	A	20030425	Heisei	H01M004-88

APPLICATION INFORMATION

STN FORMAT: JP 2001-310252 20011005
ORIGINAL: JP2001310252 Heisei

PRIORITY APPLN. INFO.: JP 2001-310252 20011005

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003

AN 2003-123776 JAPIO

AB PROBLEM TO BE SOLVED: To provide a manufacturing method of an **electrode** for a solid polymer **fuel cell** capable of maintaining characteristics specific to a porous, conductive and **water-repellent film** and attaining an efficient **electrode** reaction.

SOLUTION: This manufacturing method of the **electrode** for the solid polymer **fuel cell** comprises steps, 10-14, 16, 18, 22, 24, 26, and 28. In the steps 10-14, colloid is prepared in a **cation-exchange polymer** solution to prepare a mixture liquid of a **cation-exchange polymer** and noble metal. In step 16, the mixture liquid of the **cation-exchange polymer** and the noble metal is dropped on the porous, conductive, and a **water-repellent film** . In step 18, the porous, conductive, and **water-repellent film** is dried, and a **cathode** catalytic reaction layer is formed. In step 22, the **cathode** catalytic reaction layer and a first face of the cation-exchange film are connected together. In step 24, noble metal carrying carbon is dissolved in the **cation-exchange polymer** solution for preparing slurry. In step 26, the slurry is applied to a polymer resin plate to be dried. In step 28, the polymer resin plate is connected to a second face, onto which no **cathode** catalytic reaction layer is connected, of the **cation exchange polymer** film.

IC ICM H01M004-88
ICS H01M008-10

L104 ANSWER 3 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2003-017071 JAPIO
TITLE: **ELECTRODE** FOR **FUEL CELL**, ITS MANUFACTURING METHOD AND **FUEL CELL** HAVING IT
INVENTOR: IWASAKI KAZUHIKO; OBA TSUGIO; MIYAMA TAKESHI; ONODERA MINAKO
PATENT ASSIGNEE(S): HONDA MOTOR CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003017071	A	20030117	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 2001-201497 20010702
ORIGINAL: JP2001201497 Heisei
PRIORITY APPLN. INFO.: JP 2001-201497 20010702
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003

AN 2003-017071 JAPIO
AB PROBLEM TO BE SOLVED: To enhance the output in high current density of a **fuel cell**.
SOLUTION: An **anode** side **electrode** 24 or a

cathode side **electrode** 26 of the **fuel cell** 20 is formed by interposing **water repellent layers** 30a, 30b containing a carbon material and **polytetrafluoroethylene** between **gas diffusion** layers 6a, 6b and **electrode catalyst** layers 32a, 32b respectively. In the **electrode catalyst** layer 32a, 32b, the difference between a recessed part and a projecting part (the difference between the maximum thickness and the minimum thickness) is less than 30 μm, and the area of cracks is set to less than 10% to the areas of the **electrode catalyst** layers 32a, 32b.
COPYRIGHT: (C)2003,JPO
IC ICM H01M004-86
ICS H01M004-88

L104 ANSWER 4 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2003-017070 JAPIO
TITLE: **ELECTRODE** FOR **FUEL CELL** AND ITS MANUFACTURING METHOD
INVENTOR: YOSHIDA AKIHIKO; UCHIDA MAKOTO; YASUMOTO EIICHI; MORITA JUNJI; SUGAWARA YASUSHI; SAKAI OSAMU
PATENT ASSIGNEE(S): MATSUSHITA ELECTRIC IND CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003017070	A	20030117	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 2001-202286 20010703
ORIGINAL: JP2001202286 Heisei
PRIORITY APPLN. INFO.: JP 2001-202286 20010703
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003
AN 2003-017070 JAPIO
AB PROBLEM TO BE SOLVED: To provide an **electrode** for a **fuel cell** preventing peeling off of the **electrode** in a manufacturing process, reducing the cost, and enhancing discharging performance, by optimizing a water repellent material to be added to a **gas diffusion** layer.
SOLUTION: This **electrode** for a **fuel cell** is composed of a **gas diffusion** layer and a **catalyst** layer formed on the surface in contact with an electrolyte membrane of the **gas diffusion** layer, and the **gas diffusion layer** contains a **water repellent** material made from fiberized **polytetrafluoroethylene** having a molecular weight larger than 1,000,000, and heat treated at a temperature lower than the

melting point.
COPYRIGHT: (C)2003,JPO
IC ICM H01M004-86
ICS H01M004-88; H01M008-10

L104 ANSWER 5 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2002-260686 JAPIO
TITLE: METHOD OF MANUFACTURING MEMBRANE/ **ELECTRODE** JOINTING BODY FOR SOLID HIGH POLYMER **FUEL CELL**
INVENTOR: KOKUKYO YASUHIRO
PATENT ASSIGNEE(S): ASAHI GLASS CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002260686	A	20020913	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 2001-62101 20010306
ORIGINAL: JP2001062101 Heisei
PRIORITY APPLN. INFO.: JP 2001-62101 20010306
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
AN 2002-260686 JAPIO
AB PROBLEM TO BE SOLVED: To provide a manufacturing method of a membrane/electrolyte jointing body for a solid high polymer **fuel cell**, capable of simplifying a manufacturing process, and is moreover capable of obtaining superior **fuel cell** output.
SOLUTION: A catalyst layer is formed on at least one surface of the **ion exchange membrane.** A **water -repellent** carbon **layer** is formed on the catalyst layer, by using liquid by dispersing carbon black in solution of a solvent soluble fluorine-containing **polymer,** having substantially no **ion exchange** group.
COPYRIGHT: (C)2002,JPO
IC ICM H01M008-02
ICS C08F016-24; C08F034-02; C08F036-20; C08K003-04; C08L027-12; C08L029-10; C08L045-00; C08L047-00; C09K003-18; H01M004-86; H01M004-88; H01M004-96; H01M008-10

L104 ANSWER 6 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2001-126737 JAPIO
TITLE: **ELECTRODE** FOR A **FUEL CELL**, METHOD FOR PREPARING THE **FUEL CELL**, AND THE **FUEL CELL**

INVENTOR: KABUMOTO HIROKI; ISONO TAKAHIRO; KONNO YOSHITO; YONEZU IKURO
PATENT ASSIGNEE(S): SANYO ELECTRIC CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001126737	A	20010511	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1999-304874 19991027
ORIGINAL: JP11304874 Heisei
PRIORITY APPLN. INFO.: JP 1999-304874 19991027
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-126737 JAPIO
AB PROBLEM TO BE SOLVED: To provide an **electrode** for a **fuel cell** having improved gas diffusibility, a method for preparing the same, and a **fuel cell** with improved characteristics.
SOLUTION: A catalyst particle 3 is dispersed in a porous body, formed from a frame material 1 having **water repellency** and having surface **coated** with an **ion-exchange membrane** 2.
COPYRIGHT: (C)2001,JPO
IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-10

L104 ANSWER 7 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2001-085019 JAPIO
TITLE: HIGH POLYMER SOLID **FUEL CELL** AND MANUFACTURE OF **ELECTRODE** THEREFOR
INVENTOR: YOSHITAKE MASARU; KOKUKYO YASUHIRO; ENDO EIJI
PATENT ASSIGNEE(S): ASAHI GLASS CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001085019	A	20010330	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 1999-262921 19990917
ORIGINAL: JP11262921 Heisei
PRIORITY APPLN. INFO.: JP 1999-262921 19990917
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-085019 JAPIO
AB PROBLEM TO BE SOLVED: To improve durability while having high open

circuit voltage by forming a gas diffusion layer by flattening the surface by applying a hot press, oppositely arranging a pair of **water repellent** carbon **layers**, and arranging a catalyst layer in contact with the surface of the **water repellent** carbon **layers** after forming the **water repellent** carbon **layers** on the surface of carbon cloth. SOLUTION: A solid high polymer **fuel cell** is composed of an **ion exchange membrane** and an **electrode** in contact with both sides of it, the **electrode** is composed of a gas diffusion layer and a catalyst layer, and the gas diffusion layer is composed of a carbon cloth and **water repellent** carbon **layers** formed on the surface. The carbon cloth is desirably 100 to 600 μm a thick, and the **water repellent** carbon **layers** include a **water repellent** fluororesin and carbon black, and has a thickness of 10 to 100 μm. A hot press is desirably applied to the carbon cloth at 100 to 250°C and 15 to 150 kg/cm2. The surface is flattened so that damage of the **ion exchange membrane** is reduced.

IC ICM H01M004-88
ICS H01M004-86; H01M008-02; H01M008-10

L104 ANSWER 8 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2000-133279 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL** AND **FUEL CELL**
INVENTOR: SEKO HIDEO
PATENT ASSIGNEE(S): AISIN SEIKI CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000133279	A	20000512	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1998-304150 19981026
ORIGINAL: JP10304150 Heisei
PRIORITY APPLN. INFO.: JP 1998-304150 19981026
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-133279 JAPIO
AB PROBLEM TO BE SOLVED: To provide an **electrode** with high cell output and high durability by carrying a **catalyst** on one surface of an **electrode** substrate sheet prepared by

impregnating carbon particles into a tetrafluoroethylene sheet having air permeability.
SOLUTION: Because a **polytetrafluoroethylene sheet** with high **water repellency** is used, sufficient water treatment can be applied to an **electrode**, and an **electrode** for a **fuel cell** with high cell output and high durability can be manufactured. Since pores necessary for **gas permeability** can be ensured between tetrafluoroethylene fibers, cell output can be increased. Appropriate cracks are produced in carbon particles in a gap between tetrafluoroethylene lattices, pores necessary for **gas permeability** are ensured, and cell output can be increased. An **electrode** for a **fuel cell** and a **fuel cell** with high output and high durability can be manufactured. Preferably, an **electrode** unit having structure interposing an electrolyte between the **electrodes** and a conductive separator are stacked to manufacture a **fuel cell**.

IC ICM H01M004-86
ICS H01M004-88; H01M008-10

L104 ANSWER 9 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1999-273696 JAPIO
TITLE: SOLID POLYMER ELECTROLYTE **FUEL CELL**
INVENTOR: NEZU SHINJI; AKAKABE MICHIO; YAMADA CHIAKI; KATO MITSUAKI
PATENT ASSIGNEE(S): AISIN SEIKI CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11273696	A	19991008	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1998-76831 19980325
ORIGINAL: JP10076831 Heisei
PRIORITY APPLN. INFO.: JP 1998-76831 19980325
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1999
AN 1999-273696 JAPIO
AB PROBLEM TO BE SOLVED: To provide a solid polymer electrolyte **fuel cell** which, although being low in internal resistance, has sufficient generating performance, without adversely affecting **electrode** reactions, by having a high water content, and using a **water-repellent** polymer electrolyte **film** for its surface.

SOLUTION: This **fuel cell** comprises a solid **polymer** electrolyte film having **ion exchangeability** and a positive **electrode** and a negative **electrode** which are placed in contact with both sides thereof. In this case, the surface of the solid polymer electrolyte **film** has a **water-repellent** solid polymer electrolyte **film** formed by the crosslinked structure of styrene and divinyl benzene, the water repellency angle of the surface of the solid polymer electrolyte film being 85° or more.

IC ICM H01M008-02
ICS B05D005-08; C08L025-04; H01M008-10

L104 ANSWER 10 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1999-025992 JAPIO
TITLE: **ELECTRODE** FOR HIGH POLYMER SOLID ELECTROLYTE **FUEL CELL** AND MANUFACTURE OF THE SAME
INVENTOR: MAEDA ETSUKO; SAKAIRI KOICHI; TADA TOMOYUKI
PATENT ASSIGNEE(S): TANAKA KIKINZOKU KOGYO KK
WATANABE MASAHIRO
STONEHARD ASSOC INC
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11025992	A	19990129	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1997-190630 19970701
ORIGINAL: JP09190630 Heisei
PRIORITY APPLN. INFO.: JP 1997-190630 19970701
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1999

AN 1999-025992 JAPIO
AB PROBLEM TO BE SOLVED: To provide water repellency for an entire **electrode** by using as water repellent acrylic fluoride to be uniformly coated on a carbon particle surface so as to uniformly mixing carbon particles with catalyst non-carrier carbon particles. SOLUTION: The amount of acrylic fluoride is set to 3 to 9 wt.% of an entire **electrode** catalyst **layer**, and the **water repellency** of carbon particles and the wetting characteristic of **ion exchange resin** are maintained in optimal ranges. Catalyst non-carrier carbon particles 11 form a acrylic fluoride thin layer 13 on the full surface of individual carbon particles 12 aggregated in a cluster, in catalyst carrier carbon particles 14, catalyst particles

15 are uniformly carried on the surface of individual carbon particles 15 aggregated in a cluster, and on the entire surface, the thin layer 17 of **ion exchange resin** is formed. Thus, in the catalyst layer of the real **electrode**, a number of both carbon particles 11 and 14 are mixed and uniformly dispersed.

IC ICM H01M004-86
ICS H01M004-88

L104 ANSWER 11 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1997-320611 JAPIO
TITLE: SOLID POLYMER TYPE **FUEL CELL** AND **ELECTRODE** THEREFOR
INVENTOR: YOSHITAKE MASARU; YOSHIDA NAOKI; ISHIZAKI TOYOAKI; TERASONO SHINJI
PATENT ASSIGNEE(S): ASAHI GLASS CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09320611	A	19971212	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1996-157419 19960530
ORIGINAL: JP08157419 Heisei
PRIORITY APPLN. INFO.: JP 1996-157419 19960530
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-320611 JAPIO
AB PROBLEM TO BE SOLVED: To provide an **electrode** for solid polymer type **fuel cells** which can durably retain a sufficient **water repelling** property by **coating** the surface of fine pores of a porous gas diffusion **electrode** with a specified solvent-soluble fluorine-containing polymer.

SOLUTION: This porous gas diffusion **electrode** consists of a catalytic powder and an **ion-exchange resin** and a fluorine-containing polymer produced by using a solution of a solvent soluble fluorine-containing **polymer** having practically no **ion-exchange** group (for example, sulfonic acid group, carboxylic acid group, etc.) exists in at least a part of the surface of fine pores of the **electrode**. The existing amount of the fluorine containing polymer in the porous **electrode** is preferably 0.01-30wt.%. As the fluorine-containing polymer, perfluorocarbon polymers having an aliphatic ring structure are preferable. Non-acrylic type partially fluorinated polymers are among other examples.

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IC ICM H01M004-86
ICS H01M008-02; H01M008-10

L104 ANSWER 12 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1997-274924 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** STRUCTURE FOR **FUEL CELL**
INVENTOR: OKAMOTO TAKAFUMI; TANAKA ICHIRO; KATO HIDEO; KAWAGOE TAKAMASA; YAMAMOTO AKIO
PATENT ASSIGNEE(S): HONDA MOTOR CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09274924	A	19971021	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1997-7899 19970120
ORIGINAL: JP09007899 Heisei
PRIORITY APPLN. INFO.: JP 1996-19044 19960205
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-274924 JAPIO
AB PROBLEM TO BE SOLVED: To settle an ion conductive component while keeping it in a desired water containing rate by coating an electronically conductive catalyst supporter with **electrode** paste, followed by removing an organic solvent and settling of the ion conductive component while forcibly moistening the supporter and the paste.
SOLUTION: Carbon paper 16, which is previously subjected to a **water repellent** treatment, is **coated** with **electrode** paste. With water 26 reserved inside a reservoir 28, the paper 16 is held by a cover 36 via suspending means 30 with the surface coated with the **electrode** paste facing upward. Subsequently, when a first heater 24 is driven by a first temperature regulator 22, the water 26 is boiled to forcibly moisten the paper 16 and the **electrode** paste. At this time, a second temperature regulator 32 is driven, thereby increasing an ambient temperature sequentially or stepwise. Consequently, an organic solvent contained in the **electrode** paste is removed and an ion conductive component is settled while the content of water contained in the ion conductive component is effectively kept. After a degreasing treatment, an **anion exchanging membrane** is integrated with the paper 16 after steam drying.
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IC ICM H01M008-02

ICS H01M004-86; H01M004-88; H01M008-10

L104 ANSWER 13 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1997-092303 JAPIO
TITLE: MANUFACTURE OF SOLID POLYMER TYPE **FUEL CELL ELECTRODE**
INVENTOR: TAKEDA SHIN; KUWAHA KOUICHI
PATENT ASSIGNEE(S): AISIN SEIKI CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09092303	A	19970404	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1995-250930 19950928
ORIGINAL: JP07250930 Heisei
PRIORITY APPLN. INFO.: JP 1995-250930 19950928
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-092303 JAPIO
AB PROBLEM TO BE SOLVED: To uniformly apply an **ion exchange resin** solution to a conductive **sheet** preliminarily subjected to **water repellent** treatment by use of spin **coating** to exhibit high **water repellency** in an **electrode**, and manufacture a high durable **electrode**.
SOLUTION: A catalyst layer 2 formed of carbon black of conductive powder, platinum of catalyst metal particle, and a water repelling agent is formed on the surface of a carbon **sheet** subjected to **water repellent** treatment, and placed on a rotating plate 3. While the rotating plate 3 is rotated at a prescribed speed, an **ion exchange resin** solution is dropped from a dropping device 6 arranged above the center of the catalyst layer 2, and after the dropping is ended, the rotating plate 3 is rotated at high speed. These application and drying are repeated, whereby the **ion exchange resin** solution can be uniformly applied to the whole surface of the conductive sheet, and the control of application quantity is also facilitated. Thus, high water repellency in **electrode** can be exhibited, and the durability of **electrode** can be also improved.

IC ICM H01M008-02
ICS H01M004-88; H01M008-10

L104 ANSWER 14 OF 17 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1990-226659 JAPIO
TITLE: **ELECTRODE** CONSTRUCTION FOR **FUEL CELL**
INVENTOR: ITO MASAKI; KONDO KOJI
PATENT ASSIGNEE(S): YAMAHA MOTOR CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 02226659	A	19900910	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1989-44668 19890223
ORIGINAL: JP01044668 Heisei
PRIORITY APPLN. INFO.: JP 1989-44668 19890223
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1990

AN 1990-226659 JAPIO
AB PURPOSE: To enable the coexistence of good conductivity and **gas permeability** by forming an **electrode** base material with a bonding layer comprising a mixture of a conductive powder and water repellent agent.
CONSTITUTION: An **anode** 1 and a **cathode** 2 are made in such a way that a **catalytic** layer 5 is integrally laminated on respective base materials 4 and the layer 5 is so positioned as to oppose the side of a matrix layer 5. The base material 4 has porous structure and the layer 5 has the porous structure wherein carbon black powder carrying platinum is bonded with **PTFE** as a **water repellent** binder.
Also, the **layer** 5 comprises porous structure obtainable from the sintering of the kneaded material of silicon carbide powder and **PTFE**, and is impregnated with an electrolyte. The base materials 4 proper has strength necessary for an **electrode** base material, the characteristics of both good conductivity and **gas permeability** pertain thereto and the aforesaid characteristics can be made to coexist.

IC ICM H01M004-86
ICS H01M004-96

L104 ANSWER 15 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1986-133564 JAPIO
TITLE: **GAS DIFFUSION ELECTRODE** OF **FUEL CELL**
INVENTOR: KOSEKI KAZUO; WATANABE SHUNJI
PATENT ASSIGNEE(S): AGENCY OF IND SCIENCE & TECHNOL
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 61133564	A	19860620	Showa	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1984-254077 19841203
ORIGINAL: JP59254077 Showa
PRIORITY APPLN. INFO.: JP 1984-254077 19841203
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1986

AN 1986-133564 JAPIO
AB PURPOSE: To prevent coming off during long term operation and continue steady output by forming a **water repellent layer** of **electrode** in a specified two layer structure.
CONSTITUTION: A **catalyst layer** 4 and a **water repellent layer** 5 are bonded together, and on the opposite side of bonding layer, the **catalyst** layer 4 is in contact with electrolyte and the **water repellent layer** 5 is in contact with fuel gas or oxidizing agent gas. The **water repellent layer** 4 comprises two layers of the first layer 5a which is in contact with the **catalyst** layer 4 and made of the mixture of carbon particles and fluorine resin, and the second layer 5b which is bonded to the first layer 5a and is in contact with fuel gas or oxidizing agent gas on the opposite side and made of the mixture of metal particles and fluorine resin. For example, the **water repellent layer** 5a is formed in a thin film with the mixture of acetylene black and **polytetrafluoroethylene** resin and the **water repellent layer** 5b is formed in a thin film with the mixture of carbonyl nickel powder and **polytetrafluoroethylene** resin. The **catalyst layer** 4, **water repellent layers** 5a, 5b are stacked and hot-pressed to bond together.

IC ICM H01M004-86

L104 ANSWER 16 OF 17 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1985-133661 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**
INVENTOR: IWATA TOMOO; UMEMOTO MASATSURU; TAJIMA HIROYUKI
PATENT ASSIGNEE(S): FUJI ELECTRIC CORP RES & DEV LTD
FUJI ELECTRIC CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC

JP 60133661	A	19850716	Showa	H01M004-88

APPLICATION INFORMATION

STN FORMAT:	JP 1983-241621	19831221
ORIGINAL:	JP58241621	Showa
PRIORITY APPLN. INFO.:	JP 1983-241621	19831221

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1985

AN 1985-133661 JAPIO

AB PURPOSE: To obtain an **electrode** with high **catalyst** activity and excellent **gas diffusion** by alternately laminating a hydrophilic film consisting of **catalytic** particles and **PTFE** and a **water repellent film** consisting of carbon powder and **PTFE**, making them thin, and forming these thin films on an **electrode** substrate as a **catalytic** layer. CONSTITUTION: A hydrophilic thin film is obtained by carrying platinum on carbon powder, mixing it with **PTFE**, and molding it. Then, a **water repellent** thin **film** is obtained by mixing the carbon powder 7 with the PTFE5 and molding it. A laminating film of 0.3mm thick, for example, with a total of 128 layers in which the hydrophilic and **water repellent** thin **films** are **laminated** alternately by overlapping the films with a press or a roller. Subsequently, such an obtained laminating layer is brocken into pieces and fine particles of 5∼10μm in the outside diameter are obtained. The size of these fine particles corresponds to the thickness in which the respective one or two-**layered** hydrophilic and **water repellent layers** are **laminated**. A **catalytic** layer is formed on an **electrode** substrate using the particles with this laminating structure.

IC ICM H01M004-88

L104 ANSWER 17 OF 17 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1985-081771 JAPIO

TITLE: **FUEL CELL**

INVENTOR: ENOMOTO KENJI

PATENT ASSIGNEE(S): HITACHI LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 60081771	A	19850509	Showa	H01M008-02

APPLICATION INFORMATION

STN FORMAT: JP 1983-188409 19831011
ORIGINAL: JP58188409 Showa
PRIORITY APPLN. INFO.: JP 1983-188409 19831011
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1985

AN 1985-081771 JAPIO
AB PURPOSE: To make it possible to preserve the electrolyte of a **fuel cell** with ease without giving any harmful effect on its **gas diffusibility** by providing a **water repellant layer** independent and separated from an **electrode** base plate.
CONSTITUTION: Between an **electrode** base plate 3a, which has a **catalyst** layer 2a on one side and a small gas flow groove on the opposite side, and an **electrode** base plate 3b, which has a **catalyst** layer 2b on one side and a fuel gas flow passage on the opposite side, is provided a matrix which contains an electrolyte 5; and, between this electrolyte 5 and the **electrode** base plate 3a and the **electrode** base plate 3b, **electrode** plates 8a and 8b are respectively provided independently and separately from each other. The **electrode** plates 8a, 8b consist of carbon paper, whose main constituent is carbon fiber, with **PTFE**-diffused liquid applied on it, and they are like a thin leaf in shape and have an appropriate water repellency. The electrolytic liquid in the electrolyte 5 penetrates into the **electrode** plates 8a, 8b and reaches the **catalyst** layers 2a, 2b of the **electrode** base plates 3a, 3b, and comes in contact with the gas coming from the gas flow passage formed on each **electrode** plate, causing an electromotive force through the **catalyst** reaction.

IC ICM H01M008-02

=> file wpix
FILE 'WPIX' ENTERED AT 15:07:00 ON 06 APR 2004

FILE LAST UPDATED: 5 APR 2004 <20040405/UP>
MOST RECENT DERWENT UPDATE: 200423 <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d l101 1-18 max

L101 ANSWER 1 OF 18 WPIX
AN 2003-810731 [76] WPIX
DNN N2003-649151

TI **Fuel cell electrode** manufacturing method for electric vehicles, has electric **water repellent** carbon **layer** and **catalyst** layer formed on either sides of carbon cloth, respectively.
DC P42 X16 X21
IN HASHIGUCHI, H; XIE, G
PA (AISE) AISIN SEIKI KK
CYC 3
PI US 2002197524 A1 20021226 (200376)* 14p H01M004-94
DE 10221397 A1 20030109 (200376) H01M004-88
JP 2002343369 A 20021129 (200376) 9p H01M004-88
ADT US 2002197524 A1 US 2002-145107 20020515; DE 10221397 A1 DE 2002-10221397 20020514; JP 2002343369 A JP 2001-145552 20010515
PRAI JP 2001-145552 20010515
IC ICM H01M004-88; H01M004-94
ICS H01M008-10
ICA B05D001-18; B05D001-28; B05D005-12
AB US2002197524 A UPAB: 20031125
NOVELTY - An electric **water repellent** carbon **layer** (2) including carbon particles (2a) and water repellent **polytetrafluoroethylene** particles (2b), is formed on one portion of a **gas diffusion** substrate such as carbon cloth (1) contacting the separator, and then sintered. A **catalyst** layer (4) is provided on the other side of the carbon cloth.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for **fuel cell**.
USE - For manufacturing **electrode** of **fuel cell** (claimed) used in electric vehicles.
ADVANTAGE - Reduces contact resistance between the **electrode** and the separator, and prevents flooding at the contact portion between the **electrode** and the separator. Hence **fuel cell** with excellent power generation and high reliability is realized.
DESCRIPTION OF DRAWING(S) - The figure shows a cross- sectional view of the **fuel cell electrode**.
carbon cloth 1
carbon layers 2,3
carbon particles 2a
polytetrafluoroethylene particles 2b
catalyst layer 4
Dwg.1/7
FS EPI GMPI
FA AB; GI
MC EPI: X16-E06; X21-A01F

L101 ANSWER 2 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-653422 [62] WPIX

DNN N2003-520367
TI **Fuel cell electrode** manufacture used in vehicle, involves coating slurry containing **electrode** particle and **ion-exchange resin** particle, on **water repellent layer** formed on carbon sheet.
DC X16
PA (MITO) MITSUBISHI JUKOGYO KK
CYC 1
PI JP 2003242988 A 20030829 (200362)* 9p H01M004-88
ADT JP 2003242988 A JP 2002-43986 20020220
PRAI JP 2002-43986 20020220
IC ICM H01M004-88
ICS H01M004-92; H01M004-96
ICA H01M008-10
AB JP2003242988 A UPAB: 20030928
NOVELTY - An electroconductive **water repellent layer** is formed on one surface of a carbon sheet. A slurry which contains an **electrode** particle and an **ion-exchange resin** particle, is **coated** on the **water repellent layer** at a predetermined temperature to form a reaction layer. The surface of the reaction layer is planarized at a predetermined temperature.
USE - For **fuel cells** used as electric power unit in vehicles, buildings.
ADVANTAGE - Process is simple hence cost is minimized and yield is improved. Reduces surface roughness of the **fuel cell**.
DESCRIPTION OF DRAWING(S) - The figure shows the flowchart explaining the **fuel cell electrode** manufacturing process. (Drawing includes non-English language text). Dwg.3/6
FS EPI
FA AB; GI
MC EPI: X16-C01; X16-E06A

L101 ANSWER 3 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-203900 [20] WPIX
DNN N2003-162476
TI Production of membrane and **electrode** assemblies for solid polymer **fuel cells** comprises formation(s) of catalyst layer on **ion exchanging membrane, water-repellent** carbon **layer** and placing gas diffusion material adjacent to carbon layer.
DC X16
PA (ASAG) ASAHI GLASS CO LTD
CYC 1

PI JP 2002260686 A 20020913 (200320)* 12p H01M008-02
ADT JP 2002260686 A JP 2001-62101 20010306
PRAI JP 2001-62101 20010306
IC ICM H01M008-02
ICS C08F016-24; C08F034-02; C08F036-20; C08K003-04; C08L027-12; C08L029-10; C08L045-00; C08L047-00; C09K003-18; H01M004-86; H01M004-88; H01M004-96; H01M008-10
AB JP2002260686 A UPAB: 20030324
NOVELTY - A new method of producing a membrane and **electrode** assembly for solid polymer **fuel cells** comprises the steps: (1) a catalyst layer is formed on an **ion exchanging membrane**; (2) a **water-repellent** carbon **layer** is formed over the catalyst layer by using a solution which contains carbon black and a fluorine-containing polymer; (3) a gas diffusion material is placed adjacent to the carbon layer.

DETAILED DESCRIPTION - A new method of producing a membrane and **electrode** assembly for solid polymer **fuel cells** comprises the steps:

(1) a catalyst layer is formed on at least one face of an **ion exchanging membrane**;

(2) a **water-repellent** carbon **layer** is formed over the catalyst layer by using a solution in which carbon black is dispersed in a solution of a soluble fluorine-containing **polymer** having no **ion exchanging** groups;

(3) a gas diffusion material is placed adjacent to the carbon layer.

The **fuel cells** have **anodes**, **cathodes**, and **polymer** electrolytes of **ion exchanging membranes** which are put between the **anode** and **cathodes**. The **anodes** and **cathodes** comprise catalyst layers and gas diffusion material layers. The catalyst layers consist of catalyst and **ion exchanging resins**.

USE - For solid polymer **fuel cells**.

ADVANTAGE - Good adhesion and lower contact resistance are obtained between carbon and catalyst layers. Water supply and discharging to/from the assemblies can be carried out smoothly.

Dwg.0/0
TECH JP 2002260686 AUPTX: 20030324
TECHNOLOGY FOCUS - POLYMERS - Preferred Materials: The carbon layer is 5-300 micron thick. The solution contains the polymer and carbon black in a weight ratio of 10:90 to 50:50. The polymer has a fluorine-containing aliphatic ring structure. The polymer contains the repeating units of formula (1) - (4).
R1 - R3 = fluorine atom or trifluoromethyl group;
p = 0-5;

q = 0-4;
r = 0 or 1;
(p+q+r) = 1-6;
s, t, u = 0-5;
(s+t+u) = 1-6;
v = 1 or 2
The polymer contains the repeating units of formula (5) - (13).

FS EPI
FA AB; GI
MC EPI: X16-C01C; X16-C16; X16-E06A
PLE UPA 20030410
[1.1] 018; D11 D10 D14 D13 D23 D22 D31 D75 D76 D50 D69 D85 D86 D87 F34 F24 F- 7A Cl; P0500 F- 7A; H0293
[1.2] 018; ND01; K9416; Q9999 Q7409 Q7330; Q9999 Q7410 Q7330; K9676-R; K9698 K9676; K9574 K9483; B9999 B5301 B5298 B5276
[1.3] 018; Q9999 Q7114-R; B9999 B3509 B3485 B3372; Q9999 Q6791
[2.1] 018; P0000
[2.2] 018; ND01; K9416; Q9999 Q7409 Q7330; Q9999 Q7410 Q7330; K9676-R; K9698 K9676; K9574 K9483; B9999 B5301 B5298 B5276
[2.3] 018; Q9999 Q6917; Q9999 Q7772

L101 ANSWER 4 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-183846 [18] WPIX
DNN N2003-144822 DNC C2003-048333
TI **Electrode** for **fuel cells** has electrolyte film **electrode** assembly comprising hydrogen ion-conductive polymer electrolyte film and pair of **electrodes** which sandwich hydrogen ion-conductive polymer electrolyte film.
DC A85 L03 X16
IN KANBARA, T; MORITA, J; NIIKURA, J; SAKAI, O; SUGAWARA, Y; UCHIDA, M; YAMAMOTO, M; YASUMOTO, E; YOSHIDA, A
PA (MATU) MATSUSHITA DENKI SANGYO KK; (MATU) MATSUSHITA ELECTRIC IND CO LTD
CYC 24
PI WO 2002091503 A1 20021114 (200318)* JA 31p H01M004-86
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR
W: CN KR US
JP 2002329501 A 20021115 (200318) 7p H01M004-96
JP 2003017070 A 20030117 (200318) 5p H01M004-86
KR 2003011929 A 20030211 (200339) H01M008-10
US 2004009389 A1 20040115 (200406) H01M004-94
EP 1383184 A1 20040121 (200410) EN H01M004-86
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
CN 1462489 A 20031217 (200420) H01M004-86
ADT WO 2002091503 A1 WO 2002-JP4006 20020422; JP 2002329501 A JP 2001-132972 20010427; JP 2003017070 A JP 2001-202286 20010703; KR 2003011929 A KR 2002-717708 20021226; US 2004009389 A1 CIP of WO

2002-JP4006 20020422, US 2003-426217 20030430; EP 1383184 A1 EP 2002-720565 20020422, WO 2002-JP4006 20020422; CN 1462489 A CN 2002-801415 20020422

FDT EP 1383184 A1 Based on WO 2002091503

PRAI JP 2001-202286 20010703; JP 2001-132972 20010427

IC ICM H01M004-86; H01M004-94; H01M004-96; H01M008-10
ICS H01M004-88

AB WO 200291503 A UPAB: 20030317
NOVELTY - **Electrode** for **fuel cells** has an electrolyte film **electrode** assembly comprising a hydrogen ion-conductive polymer electrolyte film and a pair of **electrodes** which sandwich the hydrogen ion-conductive polymer electrolyte film. The **electrode** comprises a **catalyst** layer which contacts with the polymer electrolyte film and a **gas diffusion** layer which contacts with the **catalyst** layer.

DETAILED DESCRIPTION - The **gas diffusion layer** contains a fiberized **water repellent** material.

INDEPENDENT CLAIMS are also included for

(1) a polymer electrolyte **fuel cell** which has the **electrode**; and

(2) the manufacture of the **electrode** by adding a fiberized water repellent material to the **gas diffusion** layer and heating at a temperature below the melting point of the water repellent material.

USE - Used as an **electrode** for a **fuel cell** using a liquid fuel such as ethanol, methanol and dimethyl ether.

ADVANTAGE - The **electrode** is prevented from being peeled off in a production process by optimizing a water repellent material added to a **gas diffusion** layer. The **electrode** is manufactured at low cost and can provide a high discharge performance. A **fuel cell** with high discharge properties and high durability is produced safely.

DESCRIPTION OF DRAWING(S) - Figure 2 shows the water repellent material.

Primary Particles 11

Fiberized Member 12

Dwg.2/8

TECH WO 200291503 A1UPTX: 20030317
TECHNOLOGY FOCUS - POLYMERS - Preferred Materials: The water repellent material is a **polytetrafluoroethylene** of molecular weight larger than 1000000. The water repellent conductive material is distributed in the **gas diffusion** layer. The conductive particles are carbon particles including a fluoro resin. The **electrode** has a **layer** of **water repellent** conductive particles on the

surface of the side which contacts with the **catalyst** layer of the **gas diffusion** layer.
Preferred Method: The heat treatment temperature is 270-330degreesC.

ABEX WO 200291503 A1UPTX: 20030317
EXAMPLE - A water repellent layer ink is obtained by mixing 30 weight% of an aqueous dispersion of polytetrafluoroethylene to acetylene black, and the water repellent layer ink is applied on carbon paper and heated for 20 minutes at 280degreesC to produce a gas diffusion layer. A catalyst layer is formed on both surfaces of a polymer electrolyte film (Nafion 112 film). The catalyst layer is formed from a mixture of 96 weight parts of platinum catalyst supported on carbon particles, and 4 weight parts of polymer electrolyte.

FS CPI EPI
FA AB; GI
MC CPI: A12-E06A; L03-E04B; N02-F; N07-L03A
EPI: X16-C01; X16-E06A
PLE UPA 20030317
[1.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; P0511
[1.2] 018; ND01; Q9999 Q7410 Q7330; K9416; B9999 B3269 B3190

L101 ANSWER 5 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-139278 [13] WPIX
CR 2001-549902 [61]; 2002-216336 [27]; 2002-416565 [44]; 2002-672692 [72]; 2003-340645 [32]; 2003-568003 [53]
DNN N2003-110600
TI Membrane **electrode** assembly for electrochemical **fuel cell**, has one of the **electrodes** formed of sheet of compressed mass of expanded graphite particles.
DC X16
IN MERCURI, R A; WARDDRIP, M L; WEBER, T W
PA (MERC-I) MERCURI R A; (WARD-I) WARDDRIP M L; (WEBE-I) WEBER T W
CYC 1
PI US 2002160249 A1 20021031 (200313)* 14p H01M008-02
ADT US 2002160249 A1 Cont of US 2000-545956 20000410, US 2002-105753 20020325
FDT US 2002160249 A1 Cont of US 6413671
PRAI US 2000-545956 20000410; US 2002-105753 20020325
IC ICM H01M008-02
ICS H01M008-10
AB US2002160249 A UPAB: 20030828
NOVELTY - One of the **electrodes** is formed of a laminated sheet (10) of compressed mass of expanded graphite particles, containing several fluid channels (20) in between the sheet opposed surfaces (30,40) abutting an **ion exchange membrane** between the **electrodes**. The fluid channels are separated by walls (3) made of compressed mass of

expanded graphite particles and permitting interconnection of adjacent channels.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for graphite article.

USE - Membrane **electrode** assembly with graphite articles (claimed) used as electrical and thermal coupling elements for integrated circuit in computer application, as conformed electrical contact pads and electrically energized grids in de-icing equipment for electrochemical **fuel cell**.

ADVANTAGE - The flexible graphite **sheet** enhances the **moisture resistance**, handling strength, fluid permeability and isotropy with respect to thermal and electrical conductivity, hence enables more efficient **fuel cell** operation.

DESCRIPTION OF DRAWING(S) - The figure shows a side elevation view of the graphite sheet.

Wall 3

Sheet 10

Fluid channel 20

Sheet opposed surfaces 30,40

Dwg.2/8

FS EPI

FA AB; GI

MC EPI: X16-C01; X16-E06A

L101 ANSWER 6 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-660309 [71] WPIX

DNN N2002-521834 DNC C2002-185891

TI Solid polymer **fuel cell** manufacturing method for electric vehicle, involves forming catalyst layer using liquid mixture, which is arranged between polymeric electrolyte film and gaseous diffusion layer.

DC L03 X16 X21

PA (ASAG) ASAHI GLASS CO LTD

CYC 1

PI JP 2002151088 A 20020524 (200271)* 7p H01M004-86

ADT JP 2002151088 A JP 2000-341961 20001109

PRAI JP 2000-341961 20001109

IC ICM H01M004-86

ICS H01M008-02; H01M008-10

AB JP2002151088 A UPAB: 20021105

NOVELTY - A solution containing a fluorine containing **ion exchange resin** and fluorine containing compound solvent is prepared and platinum black is dispersed in the solution to obtain liquid mixture such that the viscosity of the mixture is 100-20000 cP. A catalyst layer of an **anode/cathode** is formed using the liquid mixture and is arranged between a polymeric electrolyte film and a gaseous diffusion layer.

DETAILED DESCRIPTION - The fluorine containing compound solvent is selected from fluorine containing alcohol, fluorine containing ether and fluorine containing alkane that have carbon number of 1-6. The solvent is also selected from the group of ether, alkane and dialkyl sulfoxide that do not contain fluorine and have carbon number of 1-4. The mass ratio of fluorine containing compound solvent and organic compound in the solution is 10:90-90:10. The fluorine containing compound solvent is selected from trifluoro methyl group of chlorodifluoro methyl group having hydrogen atom or the hydroxyl group. The fluorine containing **ion exchange resin** includes **polymerization** unit of perfluoro vinyl compound and tetrafluroethylene which satisfy specified relationship.

USE - For manufacturing solid polymer **fuel cell** used in electric vehicle.

ADVANTAGE - The catalyst **layer** with excellent **water-repellent** characteristics is obtained by dispersing platinum black in the solution. The solid polymer **fuel cell** which provides output stably for longer period is obtained.

Dwg.0/0

FS CPI EPI
FA AB
MC CPI: L03-E04A2
EPI: X16-C01C; X16-E06; X21-B01

L101 ANSWER 7 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-332086 [35] WPIX
DNN N2001-239195 DNC C2001-102821
TI Solid high molecular form **fuel cell** manufacturing method involves forming **electrode** having gaseous diffusion layer and catalyst layer.
DC L03 X16
PA (ASAG) ASAHI GLASS CO LTD
CYC 1
PI JP 2001085019 A 20010330 (200135)* 6p H01M004-88
ADT JP 2001085019 A JP 1999-262921 19990917
PRAI JP 1999-262921 19990917
IC ICM H01M004-88
ICS H01M004-86; H01M008-02; H01M008-10
AB JP2001085019 A UPAB: 20010625
NOVELTY - The gaseous diffusion layer is formed by hot piercing and polishing of **water repellent** carbon **layer** that is formed on carbon cloth. The catalyst **layer** is formed on **water repellent** carbon **layer.**

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for **electrode** for solid high molecular form **fuel**

cell.

USE - For manufacture of solid high molecular form **fuel cell** such as hydrogen/oxygen **fuel cell.**

ADVANTAGE - Prevents damage of **ion exchange membrane** and film thickness irregularity by forming contact layer by gaseous diffusion layer. Improves durability and open circuit voltage of cell by avoiding breakage of **ion exchange membrane.**

Dwg.0/1

FS CPI EPI
FA AB
MC CPI: L03-E04B
EPI: X16-C01; X16-E06

L101 ANSWER 8 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-162091 [17] WPIX
DNN N2001-118255 DNC C2001-048767
TI **Fuel cell** system comprises conversion apparatus for converting carbon monoxide gas to carbon dioxide using photocatalyst.
DC L03 X16
PA (DAHM) DAIHATSU MOTOR CO LTD
CYC 1
PI JP 2000340247 A 20001208 (200117)* 13p H01M008-06
ADT JP 2000340247 A JP 1999-151776 19990531
PRAI JP 1999-151776 19990531
IC ICM H01M008-06
ICS B01J035-02; C01B003-32; H01M008-02; H01M008-04; H01M008-10
ICA C01B031-20
AB JP2000340247 A UPAB: 20010328

NOVELTY - A **fuel cell** system comprises a reformer for reforming hydrogen containing compound into hydrogen rich heating gas. A conversion apparatus converts carbon monoxide gas contained in heating gas to carbon dioxide. The conversion apparatus is equipped with photoirradiation unit which irradiates photocatalyst for exhibiting catalytic activity for conversion of carbon monoxide gas to carbon dioxide gas.

DETAILED DESCRIPTION - A **fuel cell** system comprises a reformer for reforming hydrogen containing compound into hydrogen rich heating gas. A conversion apparatus converts carbon monoxide gas contained in heating gas to carbon dioxide. An electromotive force is produced by the reaction of heating gas and oxygen containing gas by which conversion process is carried out. The conversion apparatus comprises a photoirradiation unit which irradiates on a photocatalyst for exhibiting catalytic activity for conversion of carbon monoxide gas to carbon dioxide gas. An INDEPENDENT CLAIM is also included for conversion of carbon monoxide in a **fuel cell** system into carbon dioxide by

contacting carbon monoxide gas with photocatalyst which is activated by photoirradiation.

USE - As **fuel cell** system.

ADVANTAGE - The carbon monoxide containing heating gas is oxidized selectively at low temperature (low energy), hence energy efficiency of the **fuel cell** system is improved remarkably.

DESCRIPTION OF DRAWING(S) - The figure shows the isometric view of **fuel cell**.

Plates 41,42

Ion exchange membrane 43

Negative **electrode** catalyst 43A

Positive **electrode** catalyst 43B

Negative **electrode** collector 44

Positive **electrode** collector 45

Gaskets 47,48

Dwg.3/4

TECH JP 2000340247 AUPTX: 20010328

TECHNOLOGY FOCUS - ELECTRONICS - Preferred Apparatus: The **fuel cell** is equipped with two plates (41,42) having holes for flow of hydrogen gas, with an **ion exchange membrane** (43) intervened in between. A negative **electrode** catalyst (43A) capable of dissociating hydrogen gas into hydrogen ion and electron is intervened between plate (41) and **ion exchange membrane**.

A negative **electrode** collector (44) for collecting the electron produced, is provided. A positive **electrode** catalyst (43B) capable of reacting oxygen gas with hydrogen ion and electron, is intervened between plate (42) and **ion exchange membrane**. A positive **electrode** collector (45) supplies electron to positive **electrode** catalyst. The circumference of negative and positive **electrode** collectors are surrounded by gaskets (47,48). Each of the portion between the negative **electrode** collector and gasket, and positive **electrode** collector and gasket are filled with water absorbing polymer gel. A water supply layer for hydrating hydrogen ion to humidify the hydrogen gas is provided between the negative **electrode** collector and negative **electrode** catalyst or between negative **electrode** catalyst and **ion exchange membrane**.

The water supply layer has a composition of a water absorption material interposed between a pair of **moisture** permeable **water-proof sheets**.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Process: An ultraviolet light is irradiated in the **fuel cell** system at a wavelength of 200 nm or less.

ABEX JP 2000340247 AUPTX: 20010328

SPECIFIC COMPOUNDS - Photocatalyst is titanium oxide.
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C01; X16-C09

L101 ANSWER 9 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-424566 [37] WPIX
DNN N2000-316576 DNC C2000-128800
TI **Electrodes** for electrochemical **fuel cell** have **catalytic** layer in direct contact with **gas diffusion** layer containing carbon powder and water-repellent high polymer, e.g. **polytetrafluoroethylene.**
DC A14 A85 L03 X16
IN KAWAHARA, T; OZAKI, T
PA (TOYT) TOYOTA JIDOSHA KK
CYC 4
PI DE 19959671 A1 20000615 (200037)* 7p H01M004-86
JP 2000182625 A 20000630 (200037) 4p H01M004-86
CA 2292033 A1 20000611 (200044) EN H01M004-94
US 6280872 B1 20010828 (200151) H01M004-86
ADT DE 19959671 A1 DE 1999-19959671 19991210; JP 2000182625 A JP 1998-352889 19981211; CA 2292033 A1 CA 1999-2292033 19991209; US 6280872 B1 US 1999-458997 19991210
PRAI JP 1998-352889 19981211
IC ICM H01M004-86; H01M004-94
ICS H01M004-88; H01M008-02
AB DE 19959671 A UPAB: 20000807
NOVELTY - In an electrochemical **fuel cell,** which has an electrolyte membrane in contact with an **electrode** on both sides and a separator on the other side of each **electrode,** the **electrodes** have a **catalytic** layer in direct contact with a **gas diffusion** layer containing carbon powder and a water-repellent high polymer.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the production of the **electrodes.**
USE - The **electrodes** are used in electrochemical **fuel cells** (claimed).
ADVANTAGE - **Fuel cells** usually have **electrodes** based on carbon fiber woven fabric or paper to improve their electrical conductivity but such materials are very expensive. The present **electrodes** have high conductivity and can be produced cheaply.
DESCRIPTION OF DRAWING(S) - The drawing shows a cross-section through an **electrode** for a **fuel cell** of this type.
Electrolyte membrane 10
Electrode 11

Catalyst layer 12
Gas diffusion layer 14
Separator 16
Inner **gas diffusion** layer 18
Outer **gas diffusion** layer 20
Dwg.1/4

TECH DE 19959671 A1 UPTX: 20000807
TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred **Electrodes**: The **gas diffusion** layer has inner and outer layers, in which the inner layer contains finer particles, preferably of carbon black, than the outer.

TECHNOLOGY FOCUS - POLYMERS - Preferred Polymers: The **gas diffusion** layer contains **polytetrafluoroethylene** (**PTFE**) and the ratio of **PTFE** in the inner layer is lower than that in the outer layer. Production: (claimed) The **electrodes** are made by coating the **catalyst** layer directly with a combination of carbon powder and polymer and preferably heat treatment.

ABEX DE 19959671 A1 UPTX: 20000807
SPECIFIC COMPOUNDS - A specific example of the carbon powder is carbon black.

FS CPI EPI
FA AB; GI
MC CPI: A04-E08; A12-E06A; L03-E04B
EPI: X16-E06
DRN 1669-U; 1838-U
PLE UPA 20010405
[1.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; P0511
[1.2] 018; ND01; Q9999 Q6791; Q9999 Q7409 Q7330; Q9999 Q7410 Q7330; B9999 B3509 B3485 B3372; B9999 B4875 B4853 B4740; K9483-R; K9676-R; K9687 K9676; K9712 K9676

L101 ANSWER 10 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-246809 [21] WPIX
CR 2000-246808 [21]
DNN N2000-184545 DNC C2000-074811
TI **Gas diffusion electrode**, for **fuel cell**, is made by adding polymeric **catalyst** inhibitor after printing.
DC A14 A85 L03 X16
IN DATZ, A; SCHRICKER, B; WAIDHAS, M
PA (SIEI) SIEMENS AG
CYC 24
PI WO 2000013243 A2 20000309 (200021)* DE 14p H01M004-00
RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
W: CA CN JP NO US

EP 1118129 A2 20010725 (200143) DE H01M004-00
R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
JP 2002525812 W 20020813 (200267) 17p H01M004-86
ADT WO 2000013243 A2 WO 1999-DE2622 19990820; EP 1118129 A2 EP 1999-953556 19990820, WO 1999-DE2622 19990820; JP 2002525812 W WO 1999-DE2622 19990820, JP 2000-571099 19990820
FDT EP 1118129 A2 Based on WO 2000013243; JP 2002525812 W Based on WO 2000013243
PRAI DE 1998-19838786 19980826
IC ICM H01M004-00; H01M004-86
ICS H01M004-88; H01M004-90; H01M004-92; H01M008-10
AB WO 200013243 A UPAB: 20021018
NOVELTY - The inhibitor is applied after printing, by dipping the finished **fuel cell catalyst** layer into a solution containing a polymer.
DETAILED DESCRIPTION - **Gas diffusion electrode** for **fuel cells** has an electro-**catalyst** layer, with a content of a polymer A for **waterproofing** the **layer** of at most 10 wt.% and a uniform thickness at most 40 micro m.
An INDEPENDENT CLAIM is included for preparation of the **gas diffusion electrode** by impressing a screen printing paste (SPP) on a carrier in a screen printing process, and final removal of the screen printing medium. The paste contains metal **catalyst** and a screen printing medium.
USE - Used in **fuel cells** (claimed).
ADVANTAGE - The **electrode** has a decreased content of polymer A and increased homogeneity of layer thickness. The preparation method avoids the use of a wetting agent.
Dwg.0/0
TECH WO 200013243 A2UPTX: 20001114
TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Components: The polymer A content is 0.01-1 wt.%. The maximum polymer A content of the SPP 10 wt.%. The polymer A content of the electro-**catalyst** layer (ECL) is close to zero. The prepared and **coated electrode** is **waterproofed** by dipping into a solution of polymer A.
Polymer A comprises amorphous **Teflon** (RTM: **polytetrafluoroethylene** (**PTFE**)). The **catalyst** support is a substance already containing polymer A.
The screen printing paste contains Pt black or Pt on carbon, with a polymer B as binder, and a high boiling solvent. The screen printing medium is a high boiling solvent.
FS CPI EPI
FA AB
MC CPI: A04-E08; A11-B05A; A11-B05D; A12-E06A; L03-E04B
EPI: X16-C01C; X16-E06A

PLE UPA 20000502
[1.1] 018; P0000
[1.2] 018; ND01; Q9999 Q7409 Q7330; Q9999 Q7410 Q7330; B9999 B5243-R B4740; K9416
[1.3] 018; Q9999 Q6791
[2.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; S9999 S1605-R; P0511
[2.2] 018; ND01; Q9999 Q7409 Q7330; Q9999 Q7410 Q7330; B9999 B5243-R B4740; K9416
[2.3] 018; ND07; K9483-R; K9676-R; K9687 K9676; K9712 K9676; N9999 N7045 N7034 N7023; N9999 N7147 N7034 N7023; Q9999 Q7114-R; B9999 B3509 B3485 B3372; N9999 N5856; B9999 B4784 B4773 B4740

L101 ANSWER 11 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-182251 [16] WPIX
DNN N1999-133765 DNC C1999-053354
TI **Fuel cell** with gas stream path for addition of water.
DC A14 A85 L03 X16
IN TAKANO, H
PA (FJIE) FUJI ELECTRIC CO LTD
CYC 2
PI DE 19838814 A1 19990304 (199916)* 24p H01M008-10
JP 11135133 A 19990521 (199931) 9p H01M004-86
ADT DE 19838814 A1 DE 1998-19838814 19980826; JP 11135133 A JP 1998-206118 19980722
PRAI JP 1997-231997 19970828
IC ICM H01M004-86; H01M008-10
ICS H01M008-02
ICA H01M008-04
AB DE 19838814 A UPAB: 19990424
NOVELTY - Water is added to the reaction gas stream in the gas stream path of the cell so that the cell can be stably operated with simple control of the stream rate.
DETAILED DESCRIPTION - **Fuel cell** consists of a stack of individual cells (20) comprising: (a) a film (3) made of a solid polymer electrolyte; (b) an **anode catalyst** layer (1) and a **cathode catalyst** (2) which are connected to each main surface of the film (3) of the electrolyte; (c) diffusion layers (4) conductible and **permeable** for the **gas** arranged on the on the surfaces of the **catalyst** layers (1, 2) ; and (d) separators (7a, 7b) arranged on the surfaces of the diffusion layers. The separators are provided with gas stream paths (6a, 6b). The path (6a) on the **anode** side for fuel gas and the path (6b) on the **cathode** side for oxidant are arranged so that electrical energy is formed by an electrochemical reaction, in which

at least one of the fuel gas and oxidant flow as mixed fluid with the addition of water in each gas stream path. At least one of the diffusion **layers** consists of a **water-repellent** material which is permeable and conductible for gas.
USE - Non-given
ADVANTAGE - Water can be added to the **fuel cell** without impairing the characteristic **fuel cell** properties.
DESCRIPTION OF DRAWING(S) - The drawing shows the structure of an individual **cell** of a **fuel cell**.
catalyst layers 1,2
film 3
gas stream paths 6a,6b
separators 7a,7b
Dwg.4/14

TECH DE 19838814 A1 UPTX: 19990419
TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Materials: The water-repellent material has a **PTFE** fiber layer containing dispersed carbon powder, or a carbon fiber layer treated with **PTFE**, or a porous carbon material treated with **PTFE**
.

FS CPI EPI
FA AB; GI
MC CPI: A04-E08; A12-E06; L04-E04
EPI: X16-E06A
PLE UPA 19990503
[1.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0000; S9999 S1070-R; P0511
[1.2] 018; ND01; Q9999 Q7410 Q7330; K9416; B9999 B3509 B3485 B3372; B9999 B4875 B4853 B4740; K9610 K9483; K9676-R; K9712 K9676; Q9999 Q7114-R

L101 ANSWER 12 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1995-167813 [22] WPIX
DNN N1995-131663 DNC C1995-078020
TI Gas diffusion **electrode** used for **fuel cell** - has gas trap to cover whole surface of gas diffusion layer, having casing with gas intake port.
DC E36 J03 L03 X16 X25
PA (FURU-I) FURUYA C; (TANI) TANAKA KIKINZOKU KOGYO KK
CYC 1
PI JP 07090662 A 19950404 (199522)* 4p C25B011-03
JP 3310736 B2 20020805 (200258) 3p C25B011-03
ADT JP 07090662 A JP 1993-261888 19930925; JP 3310736 B2 JP 1993-261888 19930925
FDT JP 3310736 B2 Previous Publ. JP 07090662
PRAI JP 1993-261888 19930925

IC ICM C25B011-03
ICS C25B001-46; C25B011-02; H01M004-86
AB JP 07090662 A UPAB: 19951204
Gas trap is provided to cover the whole surface oa gas diffusion layer. The gas trap leaves a required space to the gas diffusion layer. the gas trap comprises a casing having a gas intake port for intake gas at its lower part and a gas exhaust port for exhausting gas through the upper part of the above space. The casing is formed by metal plate corrugation. **Water repellent** treatment by fluororesins **coating** is applied to the casing.

The gas diffusion **electrode** is applied by: (a) soaking the gas diffusion **electrode** in an electrolyte: (b) supplying a gas as bubbles in the gas trap to blow the gas in the electrolyte.

USE - The gas diffusion **electrode** is used as a **cathode** for a **fuel cell**, or electrolysis, partic. in electrolysing brine using **ion exchange membrane.**

ADVANTAGE - Soaking the **electrode** in an aq. soln. equalises pressure applied to a reaction layer and the gas diffusion layer through the gas trap. The result leaks no aq. soln. to the gas diffusion layer side. the application method stirs the aq. soln. by oxygen gas bubbles to allow access to a **cation exchange membrane.** the result uniforms aq. soln flow to reduce ohmic loss.

Dwg.1/4
FS CPI EPI
FA AB; GI; DCN
MC CPI: E11-N; E31-B01; E33-A01; J03-B01; J03-B04; L03-E04B
EPI: X16-E06A; X25-R01B
DRN 1514-P; 1706-S; 1740-S; 1781-P
CMC UPB 19951204
M3 *01* A111 A940 C101 C108 C550 C730 C801 C802 C804 C805 C807 M411 M424 M720 M740 M903 M904 M910 N120 N262 Q454
DCN: R01514-P
M3 *02* C017 C100 C810 M411 M424 M720 M740 M903 M904 M910 N120 Q454
DCN: R01781-P

L101 ANSWER 13 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1992-203550 [25] WPIX
DNN N1992-153969 DNC C1992-092435
TI Liquid-fuel battery e.g. methanol **fuel cell**, has **polymer** with **ion exchange** group added to air and/or fuel **electrodes**, to join **electrode**(s) and **ion-exchange membrane.**
DC A85 L03 X16
PA (MATU) MATSUSHITA ELEC IND CO LTD

CYC 1
PI JP 04132168 A 19920506 (199225)* 5p H01M004-86
JP 3264920 B2 20020311 (200409)B 5p H01M004-86
ADT JP 04132168 A JP 1990-253280 19900921; JP 3264920 B2 JP 1990-253280 19900921
FDT JP 3264920 B2 Previous Publ. JP 04132168
PRAI JP 1990-253280 19900921
IC ICM H01M004-86
AB JP 3264920 B UPAB: 20040205 ABEQ treated as Basic
<PatAbs><SelDwgs>1</SelDwgs><TotalDwgs Total=''3''><PatAbsBody><PNov><P>The liquid-fuel battery has air **electrode** (11) and fuel **electrode** (12) separated by an **ion-exchange membrane** (10). The fuel **electrode** comprises catalyst **layer** and **water-repellent layer** containing carbon fine powder which is subjected to water-repellent process. A **polymer** with an **ion exchange** group is added to air and/or fuel **electrodes**, to join **electrode**(s) and **ion-exchange membrane**.
</P></PNov><PDesc><P>The liquid-fuel battery has air **electrode** (oxidizing agent **electrode**) and fuel **electrode** separated by an **ion-exchange membrane**. The fuel **electrode** comprises catalyst **layer** and **water-repellent layer** containing carbon fine powder which is subjected to water-repellent process. A metal mesh is provided such that it opposes the catalyst **layer** via **water-repellent layer** . The **polymer** with an **ion exchange** group is added to air and/or fuel **electrodes**, to join **electrode**(s) and **ion-exchange membrane**. An electrolyte-liquid layer is provided between the **electrode** and **ion-exchange membrane**. The **polymer** with an **ion exchange** group, is **copolymer** of tetrafluoroethylene and perfluoro vinyl ether, or copolymer of styrene and vinyl benzene. </P></PDesc><Puse><P>For e.g. methanol **fuel cell**. </P></Puse><Padv><P>Since the permeation of methanol from fuel **electrode** to air **electrode** is suppressed, the reduction in characteristics of air **electrode** is prevented. The adhesion between **electrode** and **ion-exchange membrane** is improved by joining them using **polymer** having **ion exchange** group. Thus, high-performance liquid-fuel battery is provided.
</P></Padv><PDDWG><PSimplePara>The figure shows the block diagram of methanol **fuel cell**. (Drawing includes non-English language text). </PSimplePara><PSimplePara><Part><PartName> **ion-exchange membrane**

</PartName><PartNo>10</PartNo></Part></PSimplePara><PSimplePara><Par t><PartName> air **electrode**</PartName><PartNo>11</PartNo></ Part></PSimplePara><PSimplePara><Part><PartName> fuel **electrode**</PartName><PartNo>12</PartNo></Part></PSimplePara> <PSimplePara><Part><PartName> air chamber</PartName><PartNo>13</Part No></Part></PSimplePara><PSimplePara><Part><PartName> fuel chamber</PartName><PartNo>14</PartNo></Part></PSimplePara><PSimplePa ra><Part><PartName> adhesive agent containing **polymer** having **ion exchange** group</PartName><PartNo>15,16</PartNo></Part></PSimplePara></PDDWG>< POnline><PONov><OP> </OP></PONov></POnline></PatAbsBody></PatAbs>

AB JP 04132168 A UPAB: 20040210
Dwg.1/3
FS CPI EPI
FA AB; GI
MC CPI: A12-E06; A12-M; L03-E04B
EPI: X16-E06A
PLE UPA 20040318
[1.1] 2004; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; H0022 H0011; M9999 M2391
[1.2] 2004; G0851 G0840 G0817 D01 D02 D12 D10 D19 D18 D31 D51 D54 D58 D76 D90; R00708 G0102 G0022 D01 D02 D12 D10 D19 D18 D31 D51 D53 D58 D76 D88; H0022 H0011; M9999 M2391; P1741; P1774
[1.3] 2004; Q9999 Q7341 Q7330; Q9999 Q7410 Q7330; K9416; ND01; Q9999 Q7772; Q9999 Q8060

L101 ANSWER 14 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1987-296109 [42] WPIX
DNN N1987-221375 DNC C1987-126129
TI **Gas diffusion electrode** for **fuel cells** etc. - has reaction layer contg. platinum-gp. metal (oxide), carbon black and **PTFE**.
AW POLY TETRA FLUOROETHYLENE.
DC A85 J03 L03 M11 X16
PA (TANI) TANAKA KIKINZOKU KOGYO KK
CYC 1
PI JP 62208554 A 19870912 (198742)* 5p
ADT JP 62208554 A JP 1986-50019 19860307
PRAI JP 1986-50019 19860307
IC C25B011-03; H01M004-86
AB JP 62208554 A UPAB: 19930922

Electrode has reaction layer which has disposed alternately the hydrophilic part comprising Pt-gp. metals and/or their oxides, hydrophilic C graphite, and **PTFE**, and water-repellent part comprising water-repellent C black and **PTFE**, formed by interposing mixed part of hydrophilic and

water-repellent parts.

The **electrode** is made using the hydrophilic **sheet, water-repellent sheets,** and mixed **sheets** of hydrophilic and **water-repellent** parts, and face-bonding these sheets and rolling with repeated cycles of bonding and rolling several times, for making laminate or lapped layer, and face bonding the layer to the block, slicing the edge portion successively at right angles, heating for removing solvent from the sheets (stock sheets of reaction layer), impregnating soln. of Pt gp. cpd. into the sheets, heating the sheets, for decomposition the soln. for adhering Pt-gp. metals and/or their oxide on the hydrophilic part and the mixed part to form a reaction layer.

USE/ADVANTAGE - **Gas diffusing electrode** is used for **fuel cells,** sec. **cells,** electrochemical reactors, and **anodes** for plating. **Catalytic** performance can be improved, as the Pt-**catalyst** of the reaction layer can be contacted with electrolyte entirely, and the contact area between electrolyte and **gas diffusion** paths is increased.

0/7

FS CPI EPI
FA AB
MC CPI: A04-E08; A12-E06A; A12-E09; J03-A; J03-B; J04-E02; L03-E01B3; L03-E04B; M11-C; N02-F01; N06-D
EPI: X16-E06
PLC UPA 19930924
KS: 0210 0231 0947 2541 3250 3251 2651 2682 2739 3277 2743 3314

FG: *001* 014 04- 062 064 087 393 52& 53& 532 533 535 56& 575 592 593 60- 609 623 627 678 688 722

L101 ANSWER 15 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1987-010111 [02] WPIX
DNC C1987-003870
TI **Gas diffusion electrode** e.g. for sensor prodn. - by removal of carbon material from porous sheet comprising fluorine-contg. polymer, **catalyst** and carbon material using e.g. oxidn..
AW **PTFE.**
DC A85 L03
PA (ASAG) ASAHI GLASS CO LTD
CYC 1
PI JP 61266591 A 19861126 (198702)* 6p
ADT JP 61266591 A JP 1985-107004 19850521
PRAI JP 1985-107004 19850521
IC C25B011-04
AB JP 61266591 A UPAB: 19930922

Gas diffusion electrode is produced by removing carbon material powder from one side of a porous **electrode** sheet consisting of fluorine-contg. polymer, **catalyst** and the carbon material powder.

The fluorine-contg. polymer is e.g. **PTFE** etc. The **catalyst** is e.g. Pt, Ag, Pd, Raney Ag or spinel series oxide etc. Carbon material powder e.g. consists of carbon black, graphite or active charcoal etc. The removal of the carbon material powder is e.g. effected by a supersonic treatment, plasma treatment, oxidn. treatment of alkali treatment etc.

USE/ADVANTAGE - **Gas diffusion electrode** consisting of an electroconductive **electrode** layer contg. carbon material powder and a dielectric **water-repelling layer** contg. no carbon material powder is obtd. The **gas diffusion electrode** has a good strength and durability and is suitable for use in a hydrogen-oxygen **fuel cell** or a gas sensor etc.

0/1

FS CPI
FA AB
MC CPI: A04-E10; A12-E06A; A12-E14; L03-E01B2
PLC UPA 19930924
KS: 0210 0231 0947 2739 2743

FG: *001* 014 04- 062 064 087 60- 623 627 688 722

L101 ANSWER 16 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1982-39717E [20] WPIX
TI **Electrode** active layer - of active carbon and fibrillated **PTFE**.
AW POLY TETRA FLUOROETHYLENE OXYGEN **ELECTRODE** CHLORO ALKALI.
DC A85 E36 J03 X16 X25
IN SOLOMON, F
PA (DIAS) DIAMOND SHAMROCK CORP; (ELTE) ELTECH SYSTEMS CORP
CYC 14
PI EP 51439 A 19820512 (198220)* EN 31p
R: AT BE CH DE FR GB IT LI LU NL SE
JP 57108283 A 19820706 (198232)
US 4379772 A 19830412 (198317)
US 4518705 A 19850521 (198523)
EP 51439 B 19860528 (198622) EN
R: AT BE CH DE FR GB IT LI LU NL SE
DE 3174729 G 19860703 (198628)
CA 1208168 A 19860722 (198634)
JP 01165784 A 19890629 (198932)
JP 04358087 A 19921211 (199304) 13p C25B011-04
ADT EP 51439 A EP 1981-305093 19811028; JP 57108283 A JP 1988-275978

; US 4379772 A US 1982-425442 19820928; JP 04358087 A Div ex JP 1981-174387 19811030, JP 1991-247943 19811030

PRAI US 1980-202576 19801031; US 1980-202577 19801031; US 1982-425442 19820928; US 1983-486468 19830419

REP GB 2024045; US 3943006; GB 2018501

IC ICM C25B011-04
ICS C08J005-18; C09C001-56; C25B001-46; C25B011-02; C25B011-06; C25B011-12; H01M004-96

AB EP 51439 A UPAB: 19930915

Electrode active layer is comprised of an intimate mixt. of 60-85 wt.% active carbon and a remainder of unsintered fibrillated **PTFE**. The active carbon pref. has a particle size of 1-30 microns, an ash content of less than 4 wt.% and a BET surface area of at least 1000 sq.m/g. The active carbon may also contain a precious metal **catalysts** such as Ag or Pt.

The layers are made by adding a dil. aq. **PTFE** dispersion to a suspension of larger active carbon particles so that the latter become discontinuously coated with the **PTFE**, then fibrillating the coated particles to form an intimate mixt., comminuting the mixt. to form a granular mix and forming this into a sheet, e.g. by rolling at 60-90 deg.C. A pore-forming agent may be added to the suspension prior to fibrillation.

The layers are esp. useful in the prodn. of laminated **electrodes** in which the active layer is laminated on its working surface to current distributor and on its opposite surface to a porous coherent hydrophobic **PTFE**-contg. **waterproofing layer**. The **electrodes** are useful oxygen (air) **electrodes** in chlor-alkali **cells** and **fuel cells** having long service life and low rate of decline in operating voltage.

ABEQ US 4518705 A UPAB: 19930915

Prodn. of an **electrode** comprises adding dil. aq. dispersion of **PTFE** particles to aq. suspension of larger active carbon particles to discontinuously coat the carbon particles with the **PTFE** particles. The mixt. is shear blended to form an intimate mixt. of active carbon particles and attenuated, fibrillated **PTFE**.

The mixt. is comminuted into granules and the granules are formed into an active sheet. The working surface of this sheet is laminated to a current distributor and the opposite surface to a **PTFE**-contg. wet-proofing layer.

USE/ADVANTAGE - As an air **cathode** in chloralkali and other electrochemical **cells**, and in **fuel cells**. Improved electrical conductivity and balanced hydrophobicity are obtd..

ABEQ EP 51439 B UPAB: 19930915

A process for forming an active layer or sheet for a laminated **gas diffusion electrode** the active layer

or sheet comprising an intimate mixture of 15 to 40 weight % fibrillated **polytetrafluoroethylene** and 60 to 85 weight % active carbon particles comprising: (a) adding a dilute aqueous dispersion of **polytetrafluoroethylene** particles which are smaller than said active carbon particles to an aqueous suspension of said active carbon particles to discontinuously coat said active carbon particles with the smaller **polytetrafluoroethylene** particles (b) shear blending the discontinously coated particles to attenuate and fibrillate the **polytetrafluoroethylene** particles and form an intimate mixture thereof with said active carbon particles, (c) comminuting said intimate mixture to yield a granular mix, and (d) forming said granular mix into a sheet without sintering said **polytetrafluoroethylene.**

FS CPI EPI
FA AB
MC CPI: A04-E08; A11-A03; A11-B01; A12-E06; A12-E09; A12-S05A; E31-B01; E31-N04; E33-B; J03-B01
EPI: X16-E06; X25-R01B
DRN 1514-P; 1669-S; 1706-S; 1740-S; 1779-S; 1781-P
PLC UPA 19930924
KS: 0037 0210 0042 0231 0947 3215 2328 2416 2430 2439 2440 2444 2504 2522 2543 3251 2653 3256 2728 2729 2739 3277

FG: *001* 013 04- 06- 062 064 075 087 09- 15- 342 368 393 397 405 430 431 436 445 448 47& 477 480 502 53& 532 533 535 540 55& 56& 575 58& 595 60- 623 627 688 697
CMC UPB 19930924
M3 *01* C017 C100 C810 M411 M424 M720 M740 M903 M910 N120 N470 N513
M3 *02* A111 A940 C101 C108 C550 C730 C801 C802 C804 C805 C807 M411 M424 M720 M740 M903 M910 N120 N262 N470 N513
M3 *03* C106 C810 M411 M424 M730 M740 M781 M903 M910 N104 Q130 Q454 R043 R045

L101 ANSWER 17 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1978-48492A [27] WPIX
TI **Gas diffusion electrode** prodn. for **fuel cell** - by coating carbon fibre sheet with mixt. contg. **electrode** powder, binder and **catalyst**, and sintering.
DC A14 A85 L03 X16
PA (FJIE) FUJI ELECTRIC MFG CO LTD
CYC 1
PI JP 53058639 A 19780526 (197827)*
JP 57037110 B 19820807 (198235)
PRAI JP 1976-133036 19761105
IC H01M004-88
AB JP 53058639 A UPAB: 19930901
The method comprises (1) adding an **electrode** powder, a

dispersion soln. contg. a bonding agent, and a **catalyst** powder in a water which is cooled at <150 degrees C; (2) mixing the water with ultrasonic wave at <150 degrees C. to form a suspension; (3) adding volatile organic solvent to the suspension to form a mixt. and coating the mixt. on a **water-proof** carbon fibre **sheet** to form an **electrode** layer, and (4) sintering the **electrode** layer and the sheet.

The **electrode** has an improved oxygen electric potential of 50 mV at 100 mA/cm2. The terminal voltage of the cell is maintained steady for 4000 hours. In an example, a non-ionic surfactant, an acetylene black contg. Pt. (4.5g) and a **PTFE** dispersion are added in the water cooled at <10 degrees C. The mixt. is coated on the carbon fibres sheet treated with **PTFE** and the layer sintered at 350 degrees C, to form the **electrode.**

FS CPI EPI
FA AB
MC CPI: A12-E06; L03-E04B
PLC UPA 19930924
KS: 0210 0231 0947 2430 2434 2494 2504 2682 2723 2739

FG: *001* 011 04- 062 064 087 397 431 436 440 477 60- 609 623 627 686 688

L101 ANSWER 18 OF 18 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1970-63019R [35] WPIX
TI Manufacture of gas diffusion **electrode** - for a **fuel cell.**
DC A37 A85 L03
PA (NIST) JAPAN STORAGE BATTERY CO LTD
CYC 1
PI JP 45026938 B (197035)*
PRAI JP 1965-29970 19650521
AB JP 70026938 B UPAB: 19930831
A process for the manufacture of gas diffusion **electrode** for **fuel cell** which comprises spraying a dispersion of active carbon powder with or without catalyst in organic solution or aqueous suspension of synthetic **resin** onto an **ion**-permeable or **-exchange** film and forming successively thereon a metal **layer** and a **water-proofing layer.**
FS CPI
FA AB
MC CPI: A04-B10; A04-C04; A10-E12; A12-E06; L03-E04B
PLC UPA 19930924
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L98 ANSWER 1 OF 30 HCA COPYRIGHT 2004 ACS on STN
140:202410 **Fuel-cell electrode** with **catalyst layer** containing **water-repellent** polymer fibrous network and its manufacture.
Hori, Yoshihiro; Yasumoto, Eiichi; Sugawara, Yasushi; Morita, Junji; Yoshida, Akihiko; Yamauchi, Masaki; Uchida, Makoto (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004063250 A2 20040226, 12 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2002-219639 20020729.

AB The claimed **electrode** is equipped with a **gas-diffusion** layer and a **catalyst** layer contg. a Pt-group metal supported on conductive C, a H ion-conducting polymer electrolyte, and a water-repellent material contg. a nonswellable fibrous inactive polymer. The **electrode** is manufd. by kneading a mixt. contg. a Pt-group metal supported on conductive C, a H ion-conducting polymer electrolyte, and a water-repellent material contg. a nonswellable inactive polymer under addn. of shear force to give fibrous network of the polymer. The **catalyst** layer, esp. suitable for polymer-electrolyte **fuel cells**, has high porosity and **gas diffusivity**.

IC ICM H01M004-86
ICS H01M004-88; H01M004-92; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST water repellent polymer fibrous network **electrode** **catalyst fuel cell**

IT Polymer electrolytes
(**catalyst** layer contg.; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT Graphitized carbon black
(**catalyst**; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT Carbon black, uses

Platinum-group metals
(**catalysts**; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT Fluoropolymers, uses
(fiber; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT **Fuel cell anodes**
Fuel cell cathodes
Fuel cell electrodes
(manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT Synthetic polymeric fibers, uses
(tetrafluoroethylene; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT 663612-69-9, Flemion FSS
(**catalyst** layer contg.; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses
(**catalyst**; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

IT **9002-84-0**, D-1
(fiber; manuf. of **catalyst layer** contg. **water-repellent** polymer fibrous network for **fuel-cell electrode**)

L98 ANSWER 2 OF 30 HCA COPYRIGHT 2004 ACS on STN
139:279054 Manufacture of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**. Harada, Keizo; Mizuno, Osamu (Sumitomo Electric Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003272638 A2 20030926, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-76140 20020319.

AB The porous diffusion **electrode** is comprised of a porous metal substrate of a networked pore structure with an av. pore size of 50 μm-1 mm, and a laminated porous org. **film** with good **water repellency**. Multiple protrusions on the metal substrate piece through the org. film for increased cond. The metal porous material is made of Fe-Cr or Ni-Cr alloy with addn. of C, Ni, Mo, Cu, B, Al, Si, and/or Ti.

IC ICM H01M004-86
ICS B32B005-32; B32B015-08; C22C019-05; C22C038-00; C22C038-22; C25B011-03; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST porous diffusion **electrode fuel cell** cond **lamination water repellency**
IT Lamination
(for manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT **Electrodes**
(**gas-diffusion**; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT **Electrodes**
Fuel cells
Porous materials
(manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT Electric conductivity
(of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT Fluoropolymers, uses
(org. porous film; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., electrolyte; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT 7440-06-4, Platinum, uses
(**catalyst**; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT 7440-44-0, Carbon, uses
(**catalytic** support; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT 11149-25-0 606093-29-2, Chromium 25, iron 69, molybdenum 6
606093-30-5, Chromium 30, iron 60, molybdenum 6, nickel 4
606093-31-6, Chromium 28, copper 0.5, iron 68, molybdenum 4
606093-32-7, Boron 1.5, chromium 28, iron 65, molybdenum 6
(**electrode** substrate; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)
IT **9002-84-0, PTFE**
(org. porous film; manuf. of porous diffusion **electrode** for solid polymer electrolyte **fuel cell**)

L98 ANSWER 3 OF 30 HCA COPYRIGHT 2004 ACS on STN
138:42091 Method of fabrication of **fuel cell** **electrode** capable of attaining a high output at a high current density. Iwasaki, Kazuhiko; Miyama, Takeshi; Ohba, Tsugio; Onodera, Minako (Honda Giken Kogyo Kabushiki Kaisha, Japan). Eur.

Pat. Appl. EP 1274142 A2 20030108, 24 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2002-254552 20020628. PRIORITY: JP 2001-201497 20010702.

AB A **fuel cell** provides a high output at a high c.d. The **fuel cell** has an **anode** and a **cathode** comprising a **gas diffusion layer**, a **water-repellent layer** disposed on the **gas diffusion** layer and contg. a carbon material and **polytetrafluoroethylene**, and an **electrode catalyst layer** disposed on the **water-repellent layer** and contg. a carbon material carrying a **catalyst**. The **electrode catalyst** layer has max. and min. thicknesses that differ from each other by less than 30 μm. The **electrode catalyst** layer has cracks whose area is less than 10% of a total area of the **electrode catalyst** layer.

IC ICM H01M004-86
ICS H01M004-96; H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell electrode** fabrication
IT **Catalysts**
(electrocatalysts; method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT **Fuel cell electrodes**
(**gas diffusion**; method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT **Fuel cells**
(method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT Carbonaceous materials (technological products)
Polybenzimidazoles
(method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT Fluoropolymers, uses
(method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT Cotton
(paper; method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT 7440-06-4, Platinum, uses
(method of fabrication of **fuel cell electrode** capable of attaining high output at high c.d.)
IT 7440-44-0, Carbon, uses

(method of fabrication of **fuel cell** **electrode** capable of attaining high output at high c.d.)

IT **9002-84-0, Ptfe**
(method of fabrication of **fuel cell** **electrode** capable of attaining high output at high c.d.)

IT 107-21-1, Ethylene glycol, uses
(method of fabrication of **fuel cell** **electrode** capable of attaining high output at high c.d.)

L98 ANSWER 4 OF 30 HCA COPYRIGHT 2004 ACS on STN
137:265707 Polymer electrolyte **fuel cell** with improved durability. Wakita, Hidenobu; Hosaka, Masato (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002289204 A2 20021004, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-88418 20010326.

AB In the **fuel cell** having a pair of **electrodes** composed of a carbon fiber or carbon paper **gas-diffusion** layer at the inner side and a noble metal **catalyst**-contg. **catalyst** layer at the outer side, ≥1 of the **gas-diffusion** layer is treated to be **water-repellent** and **laminated** with the **catalyst** layer via an elec. conductive layer to prevent deterioration of the water repellency of the **gas-diffusion** layer.

IC ICM H01M004-86
ICS H01M004-88; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST polymer electrolyte **fuel cell electrode** durability; **water repellency gas diffusion layer fuel cell electrode**

IT Carbon black, uses
(acetylene black, **water-repellent** **layer** and antioxidant **layer** contg.; polymer electrolyte **fuel cell** with improved durability)

IT Ionomers
(fluoropolymers, sulfo-contg., Flemion, antioxidant layer contg.; polymer electrolyte **fuel cell** with improved durability)

IT Fluoropolymers, uses
(ionomers, sulfo-contg., Flemion, antioxidant layer contg.; polymer electrolyte **fuel cell** with improved durability)

IT **Fuel cell electrodes**
(polymer electrolyte **fuel cell** with improved durability)

IT Fluoropolymers, uses

(**water-repellent layer** contg.;
polymer electrolyte **fuel cell** with improved
durability)

IT **9002-84-0, Polytetrafluoroethylene**
(**water-repellent layer** contg.;
polymer electrolyte **fuel cell** with improved
durability)

L98 ANSWER 5 OF 30 HCA COPYRIGHT 2004 ACS on STN
137:111682 **Fuel cell** membrane-**electrode**
assembly containing **catalyst** layer, **gas**
diffusion layer, carbon fibers, and fluoropolymer
water-repellent layer. Yoshida,
Tomoaki; Morita, Toshio (Showa Denko K. K., Japan). PCT Int. Appl.
WO 2002056404 A1 20020718, 45 pp. DESIGNATED STATES: W: AE, AG,
AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID,
IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG,
MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI,
SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW,
AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH,
CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR,
NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2.
APPLICATION: WO 2002-JP252 20020116. PRIORITY: JP 2001-7655
20010116; US 2001-PV267412 20010209; JP 2001-228825 20010730; US
2001-PV308855 20010801.

AB A membrane-**electrode** assembly for a **fuel**
cell consists of an electrolyte sandwiched between
electrodes that incorporate a **catalyst** layer and a
gas diffusion layer, in which: (1) the
catalyst layer comprises a **catalyst**-contg.
conductive powder and a carbon fiber, and/or (2) the **gas**
diffusion layer consists of a **layer** contg. a
water-repellent polymer and a carbon fiber, in
which at least a part of the surface of the **gas**
diffusion comes into contact with the **catalyst**
layer. A suitable **catalyst** is platinum or a platinum
alloy. The conductive powder is typically a conductive carbon black
or a carbonaceous powder (e.g., furnace black, Ketjen Black, channel
black, etc.); carbon fibers are selected from PAN-based fibers,
pitch-based fibers, carbon nanotubes, and vapor deposited fibers
(optionally heat treated to >2000°). The hydrophobic
(water-repellent) polymer is typically a fluoropolymer (esp.
PTFE).

IC ICM H01M008-02
ICS B01J023-42

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** membrane **electrode**

catalyst gas diffusion layer; carbon fiber **fuel cell** membrane **electrode**; **PTFE water repellent layer** **fuel cell** membrane **electrode**

IT Nanotubes
(carbon fibers, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Nanotubes
(carbon, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT **Fuel cell electrodes**
Fuel cells
(**fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
(graphite, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
(graphite, whiskers, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
Fluoropolymers, uses
(membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
(nanotube, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
(pitch-based, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Carbon fibers, uses
(polyacrylonitrile-based, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Fluoropolymers, uses
(**water-repellent layer**, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT **Coating** materials
(**water-resistant**, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT Platinum alloy, base
(membrane-**electrode** assembly; **fuel**

cell membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT 7440-06-4, Platinum, uses
(membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT 7440-42-8, Boron, uses **9002-84-0, PTFE**
(membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT 7440-44-0, Carbon, uses
(nanotubes, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

IT 7782-42-5, Graphite, uses
(whiskers, membrane-**electrode** assembly; **fuel cell** membrane-**electrode** assembly contg. **catalyst** layer, **gas diffusion** layer, carbon fibers, and fluoropolymer **water-repellent layer**)

L98 ANSWER 6 OF 30 HCA COPYRIGHT 2004 ACS on STN
134:342511 **Fuel cell electrodes** showing excellent **gas diffusion** properties, their manufacture, and **fuel cells**. Kabumoto, Hiroki; Isono, Takahiro; Konno, Yoshito; Yonetsu, Ikuo (Sanyo Electric Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001126737 A2 20010511, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-304874 19991027.

AB The **electrodes** comprise **water-repellent** porous materials **coated** with ion exchangers and contg. dispersions of **catalyst** grains. The **electrodes** are manufd. by immersion of water-repellent porous materials in an ion exchanger soln. and treatment for dispersion of **catalyst** particles in the materials. **Fuel cells** with **anodes** and **cathodes** comprising of the above stated **electrodes** are also claimed.

IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38

ST **fuel cell electrode gas diffusion**; water repellent porous **electrode** ion exchanger coating; **catalyst** dispersed water repellent porous **electrode**

IT Ion exchangers
(**coatings**; **fuel cells** with **water-repellent** porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT **Fuel cell electrodes**
Porous materials
(**fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT **Diffusion**
(**gas**; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT **Catalysts**
(particles; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT Water-resistant materials
(porous; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT Fluoropolymers, uses
(porous; **fuel cells** with water-repellent

porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT 7440-06-4, Platinum, uses
(**fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT 7440-44-0, Carbon, uses
(platinum supported on; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

IT **9002-84-0, Polytetrafluoroethylene**
(porous; **fuel cells** with water-repellent porous **electrodes** having ion exchanger coatings and contg. **catalyst** particles for high **gas diffusion** properties)

L98 ANSWER 7 OF 30 HCA COPYRIGHT 2004 ACS on STN
134:44493 Polymer electrolyte **fuel cell**. Gyoten, Hisaaki; Uchida, Makoto; Yasumoto, Eiichi; Kusakabe, Hiroki; Sugawara, Yasushi; Hori, Yoshihiro (Matsushita Electric Industrial Co., Ltd., Japan). Eur. Pat. Appl. EP 1059686 A2 20001213, 10 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-112150 20000606. PRIORITY: JP 1999-159057 19990607.

AB A polymer electrolyte **fuel cell** comprises an **anode**, a **cathode**, a polymer electrolyte membrane interposed between the **anode** and the **cathode**, an **anode**-side separator plate having a gas flow path to supply fuel gas to the **anode** and a **cathode**-side separator plate having a gas flow path to supply oxidant gas to the **cathode**. Each of the **anode** and the **cathode** comprises a **catalyst** layer in contact with the polymer electrolyte membrane, an **electrode** supporting material having **gas permeability** and electronic cond., and a **water repellent layer** interposed between the **catalyst** layer and the **electrode** supporting material. The **water repellent layer** has through holes through which the **catalyst** layer and the **electrode** supporting material are elec. connected.

IC ICM H01M008-02
ICS H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST polymer electrolyte **fuel cell**
IT Surface area
(carbon **electrode**; polymer electrolyte **fuel cell** for power systems)
IT Polyvinyl butyrals
(carbon paper surface treatment with; polymer electrolyte **fuel cell** for power systems)
IT Pitch
(fluorinated; polymer electrolyte **fuel cell** for power systems)
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; polymer electrolyte **fuel cell** for power systems)
IT **Fuel cell anodes**
Fuel cell cathodes
Fuel cells
(polymer electrolyte **fuel cell** for power systems)
IT Acrylic fibers, uses
Carbon fibers, uses
(polymer electrolyte **fuel cell** for power systems)
IT Fluoropolymers, uses
(polymer electrolyte **fuel cell** for power systems)
IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; polymer electrolyte **fuel cell** for power systems)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; polymer electrolyte **fuel cell** for power systems)
IT 7440-06-4, Platinum, uses
(polymer electrolyte **fuel cell** for power systems)
IT 7440-44-0, Carbon, uses
(polymer electrolyte **fuel cell** for power systems)
IT **9002-84-0, Ptfe** 25067-11-2, Perfluoroethylene-perfluoropropylene copolymer
(polymer electrolyte **fuel cell** for power systems)
IT 9000-11-7, Cmc
(polymer electrolyte **fuel cell** for power systems)

L98 ANSWER 8 OF 30 HCA COPYRIGHT 2004 ACS on STN
131:274191 Phosphoric acid **fuel cells** and **cathode catalyst** and **cathode** using it

for the **fuel cells**. Ito, Masaru; Sato, Junji; Kurabayashi, Katsuki (NE Chemcat Corp., Japan). Jpn. Kokai Tokkyo Koho JP 11273690 A2 19991008 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-98350 19980326.

AB The **cathode catalyst** comprises a solid-soln. alloy of Pt, Ir, and/or Rh supported on a conductive C. The **cathode** comprises a conductive porous substrate on which the **catalyst** and a water-repellent polymer are deposited. The **fuel cells** having the **cathode** are also claimed. The solid-soln. alloy has high **catalytic** activity and chem. stability to hot phosphoric acid electrolyte, and the **fuel cells** have high output and long service life.

IC ICM H01M004-92
ICS H01M004-96

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 56, 67

ST **cathode catalyst** phosphoric acid **fuel cell**; solid soln alloy **catalyst fuel cell**; platinum iridium rhodium **catalyst fuel cell**

IT Fluoropolymers, uses
(**Teflon** TFE 30; **cathode** coated with solid-soln. alloy **catalyst** supported on C and water-repellent polymer for phosphoric acid **fuel cell**)

IT **Water-resistant** materials
(**cathode coated** with solid-soln. alloy **catalyst** supported on C and water-repellent polymer for phosphoric acid **fuel cell**)

IT **Catalysts**
Fuel cell cathodes
(solid-soln. alloy of Pt, Ir, and/or Rh supported on conductive C as **cathode catalyst** for phosphoric acid **fuel cell**)

IT 9002-84-0, **Poly(tetrafluoroethylene)**
(**Teflon** TFE 30; **cathode** coated with solid-soln. alloy **catalyst** supported on C and water-repellent polymer for phosphoric acid **fuel cell**)

IT 7440-44-0, Carbon, uses 39309-14-3 109076-23-5 245428-12-0 245428-13-1
(solid-soln. alloy of Pt, Ir, and/or Rh supported on conductive C as **cathode catalyst** for phosphoric acid **fuel cell**)

L98 ANSWER 9 OF 30 HCA COPYRIGHT 2004 ACS on STN
131:245610 **Fuel cell electrode** and its

manufacture using noble metal loaded carbon powder. Yasumoto, Eiichi; Gyoten, Hisaaki; Uchida, Makoto; Sugawara, Yasushi; Funakoshi, Yasutomo; Nakagawa, Kouji; Matsumoto, Toshihiro (Matsushita Electric Industrial Co., Ltd., Japan). Eur. Pat. Appl. EP 948071 A2 19991006, 12 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 1999-105131 19990326. PRIORITY: JP 1998-87509 19980331.

AB **Fuel cell electrodes** exhibiting good performance are produced in a simple manner that does not require surfactants or pore producing agents. A layer of **catalyst** powder, e.g., Pt-loaded carbon powder coated with a Nafion electrolyte, is formed on the surface of a polymer electrolyte film or a porous conductive **electrode** substrate by supplying the electrostatically charged **catalyst** powder to the electrolyte film or the **electrode** substrate or by spraying the film or substrate with the powder. The coated film or substrate is heated for drying and adhesion of the **catalyst** powder.

IC ICM H01M008-10
ICS H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell electrode** prodn
catalyst powder

IT Noble metals
Platinum-group metals
(**catalysts; fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Polyoxyalkylenes, uses
(fluorine-contg., sulfo-contg., ionomers; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Ionomers
(fluoropolymers; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT **Fuel cell electrodes**
(**fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Fluoropolymers, uses
(**fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Fluoropolymers, uses
(ionomers; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

IT Fluoropolymers, uses
Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT Fluoropolymers, uses
(**water-repellent coatings; fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT 7440-06-4, Platinum, uses
(**catalysts; fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT **9002-84-0, PTFE** 163294-14-2, Nafion 112
(**fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT 7440-44-0, Carbon, uses
(powder, **catalyst** supports; **fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)
IT 25067-11-2, Hexafluoropropene-tetrafluoroethene copolymer
(**water-repellent coatings; fuel cell electrode** prodn. using noble metal **catalyst** loaded carbon powder)

L98 ANSWER 10 OF 30 HCA COPYRIGHT 2004 ACS on STN
130:198825 Polymer electrolyte membrane-**gas diffusion electrodes** and their manufacture. Totsuka, Kazuhide (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11031515 A2 19990202 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-200760 19970710.

AB The **gas diffusion** part of the **electrode** contains C power and/or C fiber, fluoropolymer, and F-contg. polymer which is sol. in a hydrophilic org. solvent. C material and fluoropolymer are added to hydrophilic org. solvent contg. F-contg. polymer to give a dispersion which is applied on a substrate and then dipped in water for removal of the solvent and for solidification of the F-contg. polymer for formation of the **gas diffusion** layer. **Catalyst** and polymer electrolyte are applied on the **gas diffusion** layer, polymer electrolyte membrane is press-adhered thereon, and the substrate is removed to give the title **electrode**. The **electrodes** are for **fuel cells**.

IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST polymer electrolyte **gas diffusion electrode; fuel cell gas diffusion electrode;** carbon fluorine contg polymer **electrode;** fluoropolymer carbon **fuel cell electrode**
IT Fluoropolymers, uses
(Lublon; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, electrolyte; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT Polyoxyalkylenes, uses
(fluorine-contg., sulfo-contg., ionomers, electrolyte; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT **Fuel cell electrodes**
Polymer electrolytes
(**gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT Carbon fibers, uses
Fluoropolymers, uses
Fluoropolymers, uses
(**gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT **Electrodes**
(**gas-diffusion; gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)
IT Fluoropolymers, uses
Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers, electrolyte;

gas diffusion layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., electrolyte; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT Binders
(**water-repellent; gas diffusion layers** comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT **Coating** materials
(**water-resistant; gas diffusion layers** comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT **9002-84-0, Poly(tetrafluoroethylene)**
(Lublon; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT 7440-44-0, Carbon, uses
(Valcan XC; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT 77950-55-1, Nafion 115
(electrolyte; **gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT 7440-06-4, Platinum, uses
(**gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

IT 24937-79-9, KF1100
(**gas diffusion** layers comprising C fiber and/or powder, fluoropolymers, and F-contg. polymers and their laminates with polymer electrolytes for **fuel cell electrodes**)

L98 ANSWER 11 OF 30 HCA COPYRIGHT 2004 ACS on STN
130:184876 Stack of **fuel cells** with solid polymer electrolyte. Takano, Hiroshi (Fuji Electric Co., Ltd., Japan). Ger. Offen. DE 19838814 A1 19990304, 24 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1998-19838814 19980826. PRIORITY: JP 1997-231997 19970828.

AB Each cell of the stack includes an **anode catalyst** layer, a polymer electrolyte, a **cathode catalyst** layer, diffusion layers on the outer surfaces of the **electrodes**, and separators with gas channels and framing the diffusion layers. The diffusion layer on the **anode** side to which H and H2O are supplied is a **H2O-repellent** diffusion **layer** of a **H2O-repellent**, **gas-permeable**, and conducting material. This arrangement increases the tolerable flowing rate of H2O supplied with the reaction gas, and the **fuel cell** is stably operated with a simple monitoring of the flowing rate. The H2O-repellent, **gas-permeable**, and conducting material comprises a carbon-fiber layer or a porous C treated with **PTFE**.

IC ICM H01M008-10
ICS H01M008-02; H01M004-86

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 40

ST **fuel cell** stack solid polymer electrolyte; carbon fiber **PTFE** treated **fuel cell**; water tolerance **fuel cell** stack

IT **Fuel cells**
(stacks with **water-repellent** diffusion **layer**)

IT Carbon fibers, uses
(**water-repellent** diffusion **layer** in **fuel-cell** stacks from **PTFE**-treated layer of)

IT Fluoropolymers, uses
(**water-repellent** diffusion **layer** in **fuel-cell** stacks from carbon fiber layer or porous carbon treated with)

IT 7732-18-5, Water, uses
(**fuel-cell** stacks with **gas-permeable** layer repelling)

IT 7440-44-0, Carbon, uses
(**water-repellent** diffusion **layer** in **fuel-cell** stacks from **PTFE**-treated porous)

IT **9002-84-0, PTFE**
(**water-repellent** diffusion **layer** in **fuel-cell** stacks from carbon fiber layer or

porous carbon treated with)

L98 ANSWER 12 OF 30 HCA COPYRIGHT 2004 ACS on STN
129:291896 Materials for **gas diffusion** layers in polymer solid electrolyte **fuel cells** and their stacks. Kato, Hiroshi (Japan Gore Tex Inc., Japan). Jpn. Kokai Tokkyo Koho JP 10261421 A2 19980929 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-63020 19970317.

AB The **gas diffusion** layers comprise C fiber fabric having surface layers of fluoropolymers and C black and the **catalyst** layers are unified with the electrolytes. Stacks comprising polymer electrolytes, unified **catalyst** layers, and the **gas diffusion** layers contacting the **catalyst** layers are also claimed. The diffusion layers are flexible and are resistant to compression.

IC ICM H01M004-88
ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **gas diffusion** layer **fuel cell** ; carbon fiber fluoropolymer coating **fuel cell**

IT Solid state **fuel cells**
(carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT Carbon black, uses
Carbon fibers, uses
(carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT Fluoropolymers, uses
(coating; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT **Electrodes**
(**gas-diffusion**; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT **Coating** materials
(**water-resistant**; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT 214265-80-2, Primea 5510
(**catalyst** layer; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

IT **9002-84-0, PTFE**
(coating; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)
IT 190673-42-8, Gore-Select
(solid electrolyte; carbon fiber fabric with fluoropolymer-carbon black coatings for **fuel cell gas diffusion** layers and their stacks)

L98 ANSWER 13 OF 30 HCA COPYRIGHT 2004 ACS on STN
129:177965 **Gas diffusion electrodes** having **catalyst** layer for **fuel cells** and **electrode**-electrolyte membrane joint bodies. Saito, Akira (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 10223233 A2 19980821 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-39828 19970206.
AB The title **fuel cell electrodes** have C fiber-contg. **catalyst** layers on the surfaces of the porous substrates. The **catalyst** layers may contain solid polyelectrolytes, C supporting Pt **catalysts**, and/or water-repelling agents. The title **electrode**-electrolyte membrane joint bodies, are also claimed. The C fibers prevent solid components (**catalysts**, **catalyst** supports, solid polyelectrolytes, and water-repellent agents) from entering and closing pores of porous substrates. Therefore, the **electrodes** show high **catalyst** utilization efficiency.
IC ICM H01M004-86
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell gas diffusion electrode catalyst**; carbon fiber **catalyst fuel cell electrode**; platinum **catalyst fuel cell electrode**; paper carbon **electrode** Nafion electrolyte; **PTFE** water repelling agent **electrode**
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, **catalyst** layers contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)
IT Polyoxyalkylenes, uses
(fluorine-contg., sulfo-contg., ionomers, **catalyst** layers contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT **Electrodes**
(**gas-diffusion**; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT **Fuel cell electrodes**
Fuel cell electrolytes
(joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT Carbon fibers, uses
(joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT Fluoropolymers, uses
Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers, **catalyst** layers contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., **catalyst** layers contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT Fluoropolymers, uses
(**water-repelling** agents, **catalyst layers** contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT 7440-06-4, Platinum, uses
(**catalysts**; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT 77950-55-1, Nafion 115
(membranes; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT 7440-44-0, Carbon, uses
(paper, porous substrates; joint bodies of electrolyte membranes and **gas diffusion electrodes** having

C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

IT **9002-84-0, Polytetrafluoroethylene**
(**water-repelling** agents, **catalyst layers** contg.; joint bodies of electrolyte membranes and **gas diffusion electrodes** having C fiber-contg. **catalyst** layers on porous substrates for **fuel cells**)

L98 ANSWER 14 OF 30 HCA COPYRIGHT 2004 ACS on STN
123:261773 **Electrode catalytic** layers for **fuel cells**. Segawa, Noboru; Ueno, Sanji (Tokyo Shibaura Electric Co, Japan). Jpn. Kokai Tokkyo Koho JP 07192738 A2 19950728 Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-327878 19931224.

AB The articles comprise noble metal **catalyst**-loaded C powders and fluororesins as binders on porous substrates, where the C powders are (1) partially coated with F or (2) surface modified by forming water-repellent functional groups for repelling electrolytes. Resulting **fuel cells** prevent clogging of **catalytic** layers by electrolyte solns.

IC ICM H01M008-02
ICS H01M004-86; H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST **electrode catalyst** noble metal carbon; **fuel cell** noble metal fluoropolymer

IT Fluoropolymers
(binders; **electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT Vapor deposition processes
(**electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT Platinum-group metals
(**electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT **Catalysts** and **Catalysis**
(noble metals; **electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT **Electrodes**
(**fuel-cell, electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT **Coating** materials

(**water-resistant, electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT 25322-68-3, Polyethylene glycol
(CVD of; **electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT **9002-84-0, Ptfe**
(binders; **electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT 7782-41-4, Fluorine, processes
(coating; **electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

IT 7440-44-0, Carbon, uses
(**electrode catalysts** contg. noble metals-loaded carbon repellent to electrolyte solns. for **fuel cells**)

L98 ANSWER 15 OF 30 HCA COPYRIGHT 2004 ACS on STN
120:21419 Manufacture of **gas-diffusion electrodes**. Furuya, Choichi (Tanaka Precious Metal Ind, Japan; Furuya Choichi). Jpn. Kokai Tokkyo Koho JP 05225985 A2 19930903 Heisei, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-61065 19920217.

AB The title **electrodes** are prepd. by heat treatment of cold-pressed composite laminates of (a) a **gas-diffusion sheet** comprising **water-repellent** C powder and a water-repellent binder and (b) a reactive sheet, comprising hydrophilic C powder, water-repellent C powder, and water-repellent binder, which is pretreated to remove surfactants by solvent extn. The **electrodes** are **catalytic** and are useful for **fuel cells**, batteries, electrochem. reactors, plating, etc.

IC ICM H01M004-88
ICS H01M004-96

CC 76-2 (Electric Phenomena)
Section cross-reference(s): 52

ST **catalytic gas diffusion electrode; fuel cell gas diffusion electrode;** electrochem reactor **gas diffusion electrode**

IT Binding materials
(hydrophobic, for carbon powder, in manuf. of **catalytic gas-diffusion electrodes**)

IT Extraction
(removal of surfactants by, from reactive layer, in

catalytic gas-diffusion electrode prepn.)

IT Surfactants
(removal of, from reactive layers in **electrodes** by solvent extn.)

IT **Electrodes**
(**gas-diffusion**, prepn. of **catalytic**, by heat treatment after lamination)

IT **9002-84-0, PTFE**
(binder, in laminate-type **gas-diffusion electrodes**)

IT 7440-44-0, Carbon, uses
(**gas-diffusion electrodes** contg., laminate-type **catalytic**, manuf. of)

IT 9083-53-8, Triton
(removal of, from reactive layers in **electrodes** by solvent extn.)

L98 ANSWER 16 OF 30 HCA COPYRIGHT 2004 ACS on STN
117:115218 Manufacture of phosphoric acid **fuel cells** containing **water-repellent catalyst layers** for **electrodes** for stable output voltages.
Sugyama, Toshihiro (Fuji Electric Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 04118859 A2 19920420 Heisei, 4 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 1990-239314 19900910.

AB **Catalyst** layers are manufd. by prepg. a powd. **catalyst** and fluoropolymer mixt., adding an org. solvent, rolling the mix, pressing the rolled body on a C substrate, and heat treating it. Fibrous PTFE is used as the fluoropolymer.

IC ICM H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST phosphoric acid **fuel cell electrode**; fluoropolymer **catalyst fuel cell electrode**; **PTFE catalyst fuel cell electrode**

IT Fluoropolymers
(**electrodes** contg. fibrous, **catalytic**, for **fuel cells**)

IT **Electrodes**
(**fuel-cell, catalytic**, water-repellent, manuf. of)

IT **9002-84-0, PTFE**
(**electrodes** contg. fibrous, **catalytic**, for **fuel cells**)

L98 ANSWER 17 OF 30 HCA COPYRIGHT 2004 ACS on STN
104:152452 **Fuel-cell electrode.** Imahashi, Jinichi; Mori, Toshikatsu; Kahara, Toshiki; Honchi, Akio; Tamura,

Koki (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 60241655 A2 19851130 Showa, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1984-96476 19840516.

AB A **fuel-cell electrode** comprises a C base, a **water repelling layer** contg. C powder and a PTFE binder, and a layer contg. an activated C powder and a **catalyst**. Thus, **electrodes** were prepd. by applying a mixt. contg. 10 acetylene black and 30 g PTFE dispersion on a 1-mm-thick C base, heating at 380°, applying a paste of 10 g C powder contg. 15% Pt and 20 g PTFE, and by heating at 350°. A H3PO4 **fuel cell** contg. these **electrodes** had a steady voltage for 2500 h vs. 500 h for a cell contg. conventional **electrodes**.

IC ICM H01M004-96

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST phosphoric acid **fuel cell**; carbon black **fuel cell electrode**; **PTFE** **fuel cell electrode**; platinum **fuel cell electrode**

IT Carbon black, uses and miscellaneous
(**electrodes** contg., platinum **catalytic**, for **fuel cells**)

IT **Electrodes**
(**fuel-cell**, **catalytic**, platinum, contg. carbon black and PTFE)

IT **9002-84-0**
(**electrodes** contg., platinum **catalytic**, for **fuel cells**)

IT 7440-06-4, uses and miscellaneous
(**electrodes**, **catalytic**, contg. carbon black and PTFE, for **fuel cells**)

L98 ANSWER 18 OF 30 HCA COPYRIGHT 2004 ACS on STN

102:134999 Activation of a Raney nickel **electrode** for alkaline hydrogen-oxygen **fuel cells**. Matsuda, Yoshiharu; Nukuda, Toshiyuki; Morita, Masayuki (Fac. Eng., Yamaguchi Univ., Ube, 755, Japan). Denki Kagaku oyobi Kogyo Butsuri Kagaku, 52(12), 825-9 (Japanese) 1984. CODEN: DKOKAZ. ISSN: 0366-9297.

AB Activation of a Raney H **electrode** was investigated from the standpoint of the **electrode** construction. The polarization characteristics of the **electrode** whose active (**catalyst**) layer consisted of Raney Ni powder and PTFE [9002-84-0] dispersion were improved by thermal treatment in H. This effect resulted from not only a rise in **catalytic** activity by redn. but a structural change produced in the active layer by heating. The microscopic structure of the active layer controlled the effective area for the electrochem. reaction and the mass transfer of the species in the **electrode**. The

preferred method for active layer prepn. was to provide a mixed active **layer** composed of **water-repellent catalyst** obtained by pretreating the Raney Ni powder with PTFE dispersion and of nontreated hydrophilic Ni powder.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** Raney nickel **electrode; catalyst electrode fuel cell**

IT **Anodes**
(**fuel-cell, catalytic,** activation of Raney nickel for alk. hydrogen-oxygen)

IT **9002-84-0**
(**anode** contg., **fuel-cell** Raney nickel **catalytic,** activation of alk. hydrogen-oxygen)

IT 7440-02-0, uses and miscellaneous
(**catalysts, anodes, fuel-cell,** activation of alk. hydrogen-oxygen)

L98 ANSWER 19 OF 30 HCA COPYRIGHT 2004 ACS on STN

102:98447 **Gas-diffusion electrodes.** (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59177865 A2 19841008 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-54625 19830329.

AB A porous sintered Ni sheet is perforated to give 0.5-5.0-mm-diam. holes, 1 side of the sheet is coated with a **catalyst** -fluoropolymer mixt., and the **catalyst layer** is **waterproofed** with a fluoropolymer. Thus, sintered Ni sheet was perforated to give 0.7-mm-diam. holes, coated with a Pt-C-**PTFE** mixt., and the **catalysts layer** was **waterproofed** with **PTFE** [**9002-84-0**] to form an air **cathode.** The air **cathode** had a high c.d. and output voltage.

IC H01M004-86; C25B011-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery nickel **gas diffusion cathode;** platinum **PTFE** carbon **cathode** battery; carbon platinum air battery **cathode; fuel cell cathode gas diffusion**

IT **Cathodes**
(battery, **catalytic,** air-platinum)

IT **Cathodes**
(**fuel-cell, catalytic,** air-platinum)

IT **9002-84-0**
(binder, **cathodes** contg., air-platinum **catalytic, fuel-cell**)

IT 7440-06-4, uses and miscellaneous
(**cathodes,** air **catalytic, fuel-cell**)

IT 7440-44-0, uses and miscellaneous
(**cathodes**, air-platinum **catalytic**, **fuel-cell**)

L98 ANSWER 20 OF 30 HCA COPYRIGHT 2004 ACS on STN
102:53054 Oxygen **electrode**. (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59160971 A2 19840911 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-34284 19830301.

AB An O **electrode** useful for a **fuel cell**, brine electrolysis, or electrochem. deoxygenating app. consists of the following: (1) a 1st layer from a mixt. contg. C powders coated with a low-H-overvoltage **catalyst**, e.g., a Pt-group metal, Raney Ni powders, Fe powders, and a fluoropolymer (e.g., PTFE); (2) a 2nd porous Ni layer which is not treated for **H2O repelling**; (3) a 3rd **layer** from a mixt. of a **catalyst** (e.g., Pt) effective for electrochem. redn. of O and a fluoropolymer (e.g., tetrafluoroethylene-hexafluoropropylene copolymer); and (4) a 4th porous **H2O-repellent layer** based on a fluoropolymer (e.g., PTFE). The **electrode** prevents H generation.

IC H01M004-86; C25B011-03; C25B011-06

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52

ST Raney nickel iron oxygen **electrode**; **fuel cell** oxygen **electrode**; brine electrolysis oxygen **electrode**; deoxygenation electrochem oxygen **electrode**

IT Brines
(electrolysis of, oxygen **electrode** for)

IT **Electrodes**
(oxygen)

IT Fluoropolymers
(oxygen **electrode** contg.)

IT Platinum-group metals
(oxygen **electrode** contg. carbon powders coated with)

IT 7782-44-7, uses and miscellaneous
(**electrodes**)

IT **9002-84-0** 25067-11-2
(oxygen **electrode** contg.)

IT 7440-06-4, uses and miscellaneous
(oxygen **electrode** contg. **catalytic**)

IT 7440-44-0, uses and miscellaneous
(oxygen **electrode** contg. platinum group metal-coated polymers of)

IT 7439-89-6, uses and miscellaneous
(oxygen **electrode** contg. powders of)

IT 7440-02-0, uses and miscellaneous
(oxygen **electrode** contg. powders of Raney)

L98 ANSWER 21 OF 30 HCA COPYRIGHT 2004 ACS on STN
102:53052 Oxygen **electrode**. (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 59160970 A2 19840911 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1983-34282 19830301.

AB An O **electrode** useful for a **fuel cell**, brine electrolysis, or electrochem. deoxygenating app. consists of the following: (1) a porous Ni layer which is not treated for H2O repellency and contains Raney Ni or Fe; (2) a **catalyst** layer from **catalyst** powders (e.g., Pt) effective for electrochem. redn. of O and a fluoropolymer (e.g., PTFE); and (3) a porous **H2O-repellent layer** consisting of a fluoropolymer (e.g., PTFE). The porous Ni layer prevents H generation at the **electrode**.

IC H01M004-86; C25B011-03; C25B011-06

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52

ST nickel porous oxygen **electrode**; **fuel cell** oxygen **electrode**; brine electrolysis oxygen **electrode**; deoxygenation electrochem oxygen **electrode**

IT Brines
(electrolysis of, oxygen **electrode** for)

IT **Electrodes**
(oxygen)

IT Fluoropolymers
(oxygen **electrode** contg.)

IT 7782-44-7, uses and miscellaneous
(**electrodes**)

IT 7439-89-6, uses and miscellaneous 7440-02-0, uses and miscellaneous
(oxygen **electrode** contg.)

IT **9002-84-0**
(oxygen **electrode** contg.)

IT 7440-06-4, uses and miscellaneous
(oxygen **electrode** with **catalytic**)

L98 ANSWER 22 OF 30 HCA COPYRIGHT 2004 ACS on STN
101:154933 Manufacturing of air **cathodes**. (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP 59098466 A2 19840606 Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-207746 19821129.

AB A **water-repellent sheet** ≤100-μ thick and having uniformly distributed pores (diam. ≤0.1μ) is adhered (by rolling, pressing, hot pressing, or adhesion) to the air side surface of porous **cathodes** having ability of electrochem. reducing O and collecting elec. current, and a nonporous layer is formed (by vacuum film forming method) on the **water-repellent sheet**.

The air **cathodes** are capable of discharging elec. current under heavy load, have excellent storage stability, and are useful for H-O **fuel cells**, metal-air batteries, and O sensors. Thus, the air-side surface of a **cathode** substrate (0.5-mm thick) carrying 20% Pd **catalyst** and coated with a 50-μ thick PTFE [9002-84-0] sheet by hot pressing (av. pore diam. = 0.03μ) was coated with fluoroethylene-fluoropropylene copolymer [25067-11-2] (by sputtering in Ar under reduced pressure) to give an air **cathode**. The air **cathode** used in an air-Zn battery showed excellent storage stability.

IC H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
ST battery palladium air **cathode**; **PTFE** coating air **cathode**; FEP coating air **cathode**
IT **Cathodes**
(battery, air, with **coated water-repellent sheet**)
IT **9002-84-0** 25067-11-2
(**cathodes** coated with, air, battery)

L98 ANSWER 23 OF 30 HCA COPYRIGHT 2004 ACS on STN
100:124100 **Fuel-cell electrodes**. (Hitachi, Ltd., Japan; Hitachi Chemical Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 58166640 A2 19831001 Showa, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1982-49497 19820327.

AB The **catalyst** layer of **fuel-cell electrodes** is **coated** with a **water repelling** agent contg. PTFE [9002-84-0], a hexafluoropropylene suspension of PTFE or poly(trifluoroethylene), to prevent the loss of H3PO4 and to prevent the wetting of the **catalyst** layer. Thus, a conductive porous C sheet was coated with a **catalyst**-PTFE dispersion mixt., dried, and sintered to prep. an **electrode** which had a higher emf. than the **electrode** without the **PTFE** treatment.

IC H01M004-86
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell catalytic electrode**; **PTFE** treatment **fuel cell electrode**
IT **Electrodes**
(**fuel-cell, catalytic, PTFE**-treated)
IT **9002-84-0**
(**electrodes** treated with, **fuel-cell catalytic**)

L98 ANSWER 24 OF 30 HCA COPYRIGHT 2004 ACS on STN
97:135743 **Gas-diffusion electrode.**
(Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 57095080 A2 19820612 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1980-171890 19801204.

AB A **gas-diffusion electrode** useful in air-H **fuel cells**, air button-type cells, etc., consists of a **catalyst layer** and a **water-repellent layer**, the latter being obtained by gluing together a no. of different **water-repellent** resin **sheets** (multiporous **PTFE** film, polypropylene, polyethylene, nylon, etc.). The **electrode** is durable and gives good reliability.

IC H01M004-86

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52

ST **gas diffusion electrode** multiporous polymer

IT Polyamides, uses and miscellaneous
Polymers, uses and miscellaneous
(**water-repellent layer**, in **gas-diffusion electrode**)

IT **Electrodes**
(**gas-diffusion**, with **catalyst layer** and **water-repellent layer**)

IT **9002-84-0** 9002-88-4 9003-07-0
(**water-repellent layer**, in **gas-diffusion electrode**)

L98 ANSWER 25 OF 30 HCA COPYRIGHT 2004 ACS on STN
97:135742 **Gas-diffusion electrode.**
(Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 57095079 A2 19820612 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1980-171889 19801204.

AB A **gas-diffusion electrode** for an air-H **fuel cell**, air-Zn battery, and an air button-type battery, etc., is obtained by gluing together a **catalyst layer** and **water-repellent** resin **film**, the **water-repellent** resin **film** consisting of several **sheets** of a **water-repellent** resin **film** (e.g., multiporous fluorinated resin) attached to a substrate film via adhesives (**PTFE** or C2F4-C3F6 copolymer dispersion) or heat treatment. The battery is stable with high reliability.

IC H01M004-86

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52

ST air diffusion **electrode** fluorinated resin; **gas diffusion electrode** fluorinated resin
IT Fluoropolymers
(binding material, for **gas-diffusion electrodes**)
IT Binding materials
(fluoropolymers, for **gas-diffusion electrodes**)
IT **Electrodes**
(**gas-diffusion**, film, with **catalyst layer** and **water-repellent** resin **film**)
IT **9002-84-0** 25067-11-2
(binding material, for fluorinated resin, for **gas-diffusion electrode**)

L98 ANSWER 26 OF 30 HCA COPYRIGHT 2004 ACS on STN
92:217968 A graphite-resin composite **electrode** structure, and a process for its manufacture. Iemmi, Giuliand; Macerata, Diego (Centro Ricerche Fiat S.p.A., Italy). Brit. UK Pat. Appl. GB 2023916 19800103, 7 pp. (English). CODEN: BAXXDU. APPLICATION: GB 1979-17394 19790518.
AB An **electrode** for use in H-air **fuel cells** with acid electrolytes comprises a porous graphite-resin composite contg. **catalyst**, one face of the structure being treated to render it water-repellent and opposite faces having the same or different pore sizes. Strengthening fibers which act as a rheophore are incorporated in the composite or interposed between 2 layers of the structure. Thus, 4,4'-carbonyldiphthalic anhydride and 5-norbornane-2,3-dicarboxylic anhydride were dissolved in MeOH in a 1:1 ratio with a stoichiometric equiv. amt. of diaminodiphenylmethane, and powd. graphite was added to give a suspension contg. 70% graphite and 30% polyimide [25750-54-3] monomers. The mixt. was heated at 150° to evap. the MeOH and at 250° to partly crosslink the resin, ball milled, and blended with Na2SO4 pore-forming agent and WC **catalyst** to give a 1st mixt. contg. resin mixt. 1, Na2SO4 (particle size <33μ) 0.5, and WC 1.18 g, and a 2nd mixt. contg. 1.5 g resin mixt. and 2 g Na2SO4 (particle size 44-88μ). The 1st mixt. was placed in a stamping mold followed by a graphite fiber mesh and the 2nd mixt., the composite was heated 60 min at 300° and 500 kg/cm2 pressure, and annealed at 250°. The **electrode** was boiled in H2O .apprx.2 h to remove Na2SO4 and one face was coated with PTFE [9002-84-0].
IC H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 37
ST **fuel cell electrode** manuf; graphite

polyimide composite **electrode**; hydrogen air **fuel cell electrode**

IT Polyimides, uses and miscellaneous
(binders, **electrodes** of graphite and crosslinked, for hydrogen-air **fuel cells**)

IT **Electrodes**
(**fuel-cell**, **catalytic**, porous graphite-polyimide, manuf. of)

IT Carbon fibers
(graphite, polyimide-powd. graphite composites reinforced by, for **fuel-cell electrodes**)

IT 25750-54-3
(binders, **electrodes** of graphite and crosslinked, for hydrogen-air **fuel cells**)

IT 12070-12-1
(**catalysts**, graphite-polyimide **electrodes** contg., for **fuel cells**)

IT **9002-84-0**
(**electrodes** with **water-repellent coatings** of, **fuel-cell**)

IT 7782-42-5, uses and miscellaneous
(**electrodes**, with polyimide binder, for hydrogen-air **fuel cells**)

IT 7757-82-6, uses and miscellaneous
(pore-forming agent, in manuf. of **fuel-cell electrodes**)

L98 ANSWER 27 OF 30 HCA COPYRIGHT 2004 ACS on STN
88:81091 Multilayer **electrode**. Yamamoto, Hiroshi; Igarashi, Masayoshi (Oval Engineering Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 52122276 19771014 Showa, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1975-144785 19751204.

AB Multilayer **electrodes** for an electrolytic cell in which 1 side makes contact with a gas and the other side with an electrolyte consist of (from the side making contact with an electrolyte) a porous electroconductive **layer**, a porous **water-repellent layer**, and a porous **catalyst** layer. These **electrodes** are useful as the **cathode** in cells used to decomp. N oxides, and as the air **electrode** of air batteries and **fuel cells**. Thus, 1 side of a porous electroconductive film (porosity 60%, elec. resistivity 0.02 Ω cm), obtained by coating a porous textile sheet with a porosity of 90% with a dense anisotropic pyrolyzed C, was sprayed with a 12% aq. Teflon dispersion and dried to form a porous **H2O-repellent layer**. A slurry of activated C in Me2CHOH was then **coated** over the **H2O-repellent layer** and dried. The material was then baked for 15 min at 380°. When this

electrode was used as the **cathode** in a N oxide decompn. app. by allowing the gas to make contact with the activated-C layer, the N oxides were reduced to N with high efficiency.

IC C25B011-00
CC 72-3 (Electrochemistry)
Section cross-reference(s): 59
ST **cathode** carbon **Teflon** nitrogen oxide; electrochem redn nitrogen oxide **cathode**
IT Reduction, electrochemical
(of nitrogen oxide, multilayer **cathode** for)
IT **Cathodes**
(multilayer, for nitrogen oxide decompn.)
IT 7440-44-0, uses and miscellaneous
(**cathode**, with **Teflon**, for nitrogen oxide decompn.)
IT **9002-84-0**
(**cathode**, with carbon, for nitrogen oxide decompn.)
IT 11104-93-1, reactions
(redn. of, carbon-**Teflon cathode** for)

L98 ANSWER 28 OF 30 HCA COPYRIGHT 2004 ACS on STN
84:20242 Gas **electrodes**. Kordesch, Karl V. (Union Carbide Corp., USA). U.S. US 3899354 19750812, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1973-395552 19730910.

AB A thin **catalyzed** gas **electrode** for **fuel cells** and a process for producing it are disclosed. The **electrode** comprises a porous wetproofed conductive substrate (carbon paper) have a 1st **H2O-repellent** porous active conductive **layer** (3-15 mil thick) over which is a surface-deposited noble metal **catalyst** in an amt. ≥0.5 mg/cm2. Thus, an active C [7440-44-0] layer .apprx.5 mil thick was obtained by spraying a mixt. of poly(tetrafluoroethylene) [9002-84-0] suspension and activated C. **Fuel cells** employing air and H gas **electrodes** of this invention with 1.5 mg Pt [7440-06-4]/cm2 can operate continuously at a terminal voltage >0.50 V at 80 mA/cm2 for >8000 hr.

IC H01M
NCL 136086000D
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell catalyst electrode** ; platinum **electrode fuel cell**
IT **Electrodes**
(**fuel-cell**, platinum **catalytic**)
IT 7440-06-4, uses and miscellaneous
(**catalyst**, **fuel-cell**)
IT **9002-84-0**

(**electrodes** contg. carbon wetproofed with, **fuel -cell** platinum **catalytic**)

IT 7440-44-0, uses and miscellaneous
(**electrodes** contg. wetproofed, **fuel-cell** platinum **catalytic**)

L98 ANSWER 29 OF 30 HCA COPYRIGHT 2004 ACS on STN
78:105238 Mechanism of operation of a hydrophobic **gas diffusion electrode**. Baranov, A. P.; Pokatova, G. M.; Shteinberg, G. V.; Bagotskii, V. S. (USSR). Issled. Obl. Khim. Istochnikov Toka, No. 2, 147-56 From: Ref. Zh., Khim. 1972, Abstr. No. 17B1295 (Russian) 1971.

AB The effect of the content of a waterproofing agent (**Teflon**) (α) in theactive **layer** of a **waterproofed electrode** with a Pt **catalyst**, made by the proviously described technique, on **gas permeability** (k), effective electrolyte cond. in proes (κeff) and the ionization rate (i) of O in alk. and acid electrolytes and H in acid electrolyte was studied. With increase of α the κ and K decreased, and ι passed through a max. at some optimum value of α (αopt). In 7N KOH the αopt was .apprx.8-10% and in 5N H2SO4 the αopt was .apprx.2%. The increase of ι on the ascending branch of a (ι,α) curve is presumed to be due to gas transfer in the **electrode**, and decrease of ι on the descending branch of this curve is assocd. with decrease of κeff.

CC 77-2 (Electrochemistry)

ST wetproofed **gas diffusion electrode**; **Teflon** waterproofed **electrode**; ionization oxygen hydrogen **electrode**; oxygen ionization waterproofed **electrode**; hydrogen ionization waterproofed **electrode**

IT **Electrodes**
(**fuel-cell**, wet proofing of **gas-diffusion**)

IT 7440-06-4, uses and miscellaneous
(**catalysts**, for **gas-diffusion fuel-cell electrodes**)

IT **9002-84-0**
(wetproofing by, of **gas-diffusion fuel-cell electrodes**)

L98 ANSWER 30 OF 30 HCA COPYRIGHT 2004 ACS on STN
77:82785 Air **electrode** for **fuel cells**. II. Characteristics for the plastic-bonded double layer air **electrode**. Ikeda, Hironosuke; Sakai, Takashi; Kumeta, Masao (Res. Dev. Cent., Sanyo Electr. Co., Ltd., Hirakata, Japan). Denki Kagaku, 40(4), 315-20 (Japanese) 1972. CODEN: DNKKA2. ISSN:

0366-9440.

AB A double-layer type air **electrode** consisting of the **catalyst layer** and the **waterproofed** graphite **layer** was prepd., and the effects of molding pressure and the thickness of the double layer on its performance characteristics were studied. A charcoal powder suspended in the soln. of Ag salt was reduced to prep. a charcoal powder coated with metallic Ag. The product obtained was mixed with poly(tetrafluoroethylene) and the mix. was heated to prep. the waterproofed **catalyst** powder. This powder was mixed with poly(tetrafluoroethylene), pressed to mold, and heated again. The molding pressure was 50, 100, 200, 300, and 400 kg/cm2. A similar **electrode** was prepd. from graphite. The graphite **layer** showed an excellent **waterproof** effect. The **electrode** made at the molding pressure of 200 kg/cm2 gave the best performance characteristics. The **electrodes** with a 1 mm **catalyst** layer and a 5 mm graphite layer, molded at 200 kg/cm2, showed the longest life period, maintaining their performance as long as 5,000 hr.

CC 77-2 (Electrochemistry)

ST air **electrode fuel cell**; plastic bonded air **electrode**; waterproofed graphite air **electrode**; PTFE charcoal silver **fuel cell**

IT Charcoal
(**electrodes, fuel-cell,** double-layer type air)

IT **Electrodes**
(**fuel-cell,** double-layer type air)

IT 7440-22-4, uses and miscellaneous
(**catalysts, fuel-cell electrode**)

IT **9002-84-0**
(**electrodes** contg., **fuel-cell** double-layer type air)

IT 7782-42-5, uses and miscellaneous
(**electrodes, fuel-cell,** double-layer type air)

=> => d l99 1-54 ti

L99 ANSWER 1 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Membrane-**electrode** laminate

L99 ANSWER 2 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Application of a surfactant for a polymer electrolyte **fuel cell**

L99 ANSWER 3 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **electrode** for **fuel cell**

L99 ANSWER 4 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Degradation mechanism of polystyrene sulfonic acid membrane and application of its composite membranes in **fuel cells**

L99 ANSWER 5 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **fuel-cell electrode** by coating of paste containing conductive particle and resin

L99 ANSWER 6 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI The gas diffusion **electrode** for polymer type **fuel cell**

L99 ANSWER 7 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Ion-exchange fluororesin precursor compositions, preparation method thereof, and membrane **electrode** assemblies and solid polymer electrolyte **fuel cells** therewith

L99 ANSWER 8 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Electrolyte membrane-**electrode** assemblies (MEAs) for polymer electrolyte **fuel cells**

L99 ANSWER 9 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **fuel cell electrodes** for high catalyst utilization and their manufacture

L99 ANSWER 10 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Phosphoric acid **fuel cells** with **electrode catalyst** layers containing fluoropolymers

L99 ANSWER 11 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cell electrodes**, their manufacture, and **fuel cells**

L99 ANSWER 12 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Solid polymer electrolyte **fuel cells** and their **electrodes**

L99 ANSWER 13 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance

L99 ANSWER 14 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Technology of the hydrogen energy generated electricity. (II).

Effect of the **electrode** additives on the discharge property of the **ion exchange membrane fuel cells**

L99 ANSWER 15 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of polymer electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**

L99 ANSWER 16 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Membrane-**electrode** assembly for electrolytic **cells** and **fuel cells**, and its preparation

L99 ANSWER 17 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Electrochemical properties of Ml(NiCoMnCu)5 used as an alkaline **fuel cell anode**

L99 ANSWER 18 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Solid polymer electrolyte **fuel cells** and their manufacture

L99 ANSWER 19 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI A method of forming a membrane **electrode** assembly for a direct-feed **fuel cell**

L99 ANSWER 20 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Current efficiency for soybean oil hydrogenation in a solid polymer electrolyte reactor

L99 ANSWER 21 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Electrode**-electrolyte membrane joint bodies for **fuel cells**

L99 ANSWER 22 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of solid polymer electrolyte **fuel cell electrodes**

L99 ANSWER 23 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Proton exchange with alkaline ions in Nafion

L99 ANSWER 24 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Gas diffusion **electrodes** for hydrogen-oxygen **fuel cells** and catalyst dispersion solution

L99 ANSWER 25 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Solid polymer electrolyte **fuel cells**

L99 ANSWER 26 OF 54 HCA COPYRIGHT 2004 ACS on STN

TI Manufacture of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates

L99 ANSWER 27 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **electrodes** for phosphoric acid **fuel cells**

L99 ANSWER 28 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI The performance of Raney Ni hydrogen **electrode** for alkaline **fuel cell**

L99 ANSWER 29 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **electrodes** for **fuel cells** using **ion-exchange membranes**

L99 ANSWER 30 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **electrodes** for **fuel cells** using **ion-exchange** electrolyte **membranes**

L99 ANSWER 31 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Advances in the use of perfluorinated **cation exchange membranes** in integrated water electrolysis and hydrogen/oxygen **fuel cell** systems

L99 ANSWER 32 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Electrogenerative oxidation of model alcohols at packed bed **anodes**

L99 ANSWER 33 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Ionomeric polymers with ionomer membrane in pressure-tolerant gas-diffusion **electrodes**

L99 ANSWER 34 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Ionomer membranes in pressure-tolerant gas-diffusion **electrodes**

L99 ANSWER 35 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI A composite membrane/**electrode** structure having interconnected roadways of catalytically active particles

L99 ANSWER 36 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Gas-diffusion **electrode**

L99 ANSWER 37 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **ion-exchange membrane-electrode** joints

L99 ANSWER 38 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **ion-exchange membrane-electrode** joints

L99 ANSWER 39 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **ion-exchange membrane-electrode** joints

L99 ANSWER 40 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **ion-exchange membrane-electrode** joints

L99 ANSWER 41 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Manufacture of **ion-exchange membrane-electrode** joint

L99 ANSWER 42 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Catalytic** reaction process

L99 ANSWER 43 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Gas diffusion **electrodes**

L99 ANSWER 44 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel-cell electrode**

L99 ANSWER 45 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel-cell electrode**

L99 ANSWER 46 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cells**

L99 ANSWER 47 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI A **fuel cell electrode**

L99 ANSWER 48 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cells**

L99 ANSWER 49 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Multiple-electrolyte high-voltage **fuel cell**

L99 ANSWER 50 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI 5 Watt hydrogen-air cell

L99 ANSWER 51 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Electrodes** for **fuel cells**

L99 ANSWER 52 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Combined product removal and temperature control system for

fuel cells

L99 ANSWER 53 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI **Electrode** structure and **fuel cell** incorporating it

L99 ANSWER 54 OF 54 HCA COPYRIGHT 2004 ACS on STN
TI Electrodeposition of polymers in porous **electrodes**

=> => d l99 1,3,9,10,11,13,15,19,26,31,35,51,53 cbib abs hitind

L99 ANSWER 1 OF 54 HCA COPYRIGHT 2004 ACS on STN
140:220708 Membrane-**electrode** laminate. Inoue, Yuichi; Hasegawa, Takuya (Asahi Kasei Corporation, Japan). Jpn. Kokai Tokkyo Koho JP 2004071362 A2 20040304, 11 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-229266 20020806.
AB The laminate, esp. for a **fuel cell**, has an **electrode** catalyst layer on ≥1 side of an oriented fluoropolymer **ion exchange membrane**; where the **membrane** has a thickness of 1-500 μm and a film plane orientation (ΔP) ≥0.0005. The laminate is manufd. by setting the temp. below 120° while forming the **electrode** catalyst layer on the **ion exchange membrane**.
IC ICM H01M008-02
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** fluoropolymer **ion exchange membrane electrode** laminate manuf
IT **Fuel cell electrodes**
Fuel cell electrolytes
Fuel cells
(membrane-**electrode** laminates contg. **electrode** catalyst layers on thickness and plane orientation controlled fluoropolymer **ion exchange membranes** for **fuel cells**)
IT Fluoropolymers, uses
(membrane-**electrode** laminates contg. **electrode** catalyst layers on thickness and plane orientation controlled fluoropolymer **ion exchange membranes** for **fuel cells**)
IT 7440-06-4, Platinum, uses 7440-44-0, Carbon, uses
(membrane-**electrode** laminates contg. **electrode** catalyst layers on thickness and plane orientation controlled fluoropolymer **ion exchange membranes** for **fuel cells**)

IT **9002-84-0, PTFE**
(membrane-**electrode** laminates contg. **electrode** catalyst layers on thickness and plane orientation controlled fluoropolymer **ion exchange membranes** for **fuel cells**)

L99 ANSWER 3 OF 54 HCA COPYRIGHT 2004 ACS on STN
139:9314 Manufacture of **electrode** for **fuel cell**. Kakutani, Osamu; Okiyama, Gen; Suzuki, Takashi; Shibata, Tetsuo; Kamiyama, Youichi; Watanabe, Hideki; Date, Tomoko; Hirano, Yoshiki (Honda Giken Kogyo Kabushiki Kaisha, Japan). PCT Int. Appl. WO 2003047018 A1 20030605, 138 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2002-JP12301 20021126. PRIORITY: JP 2001-366598 20011130; JP 2001-366631 20011130; JP 2001-366662 20011130; JP 2001-366711 20011130; JP 2002-148428 20020522; JP 2002-148429 20020522; JP 2002-148099 20020522; JP 2002-147550 20020522; JP 2002-147579 20020522; JP 2002-163549 20020604.

AB The **electrode**, having an **ion exchange membrane** between a **cathode** layer and an **anode** layer; and is manufd. by applying an **electrode** (**cathode** or **anode**) soln. on a sheet to form an **electrode** layer; applying an **ion exchange membrane** soln. on the undried **electrode** layer to form the **ion exchange membrane**; applying a counter **electrode** soln. on the undried membrane to form the counter **electrode** layer; and solidifying the **electrode**-membrane stack by drying.

IC ICM H01M008-02
ICS H01M004-86; H01M004-88; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell electrode** manuf

IT Fluoropolymers, uses
(**anode** binder; manuf. of **electrodes** for **fuel cells**)

IT **Fuel cell electrodes**
(manuf. of **electrodes** for **fuel cells**)

IT Fluoropolymers, uses
(sulfonated, **cathode** binder; manuf. of **electrodes** for **fuel cells**)

IT **9002-84-0D, Polytetrafluoroethylene**, sulfonated
(**cathode** binder; manuf. of **electrodes** for **fuel cells**)
IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses 25190-89-0, Hexafluoropropylene-tetrafluoroethylene-vinylidene fluoride copolymer
(manuf. of **electrodes** for **fuel cells**)
IT 7440-44-0, Carbon, uses
(manuf. of **electrodes** for **fuel cells**)

L99 ANSWER 9 OF 54 HCA COPYRIGHT 2004 ACS on STN
135:48588 Manufacture of **fuel cell electrodes** for high catalyst utilization and their manufacture. Hitomi, Shuji (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001167770 A2 20010622, 11 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-300227 19991021. PRIORITY: JP 1999-272166 19990927; JP 1999-278308 19990930.
AB The **electrodes** are solid electrolyte-catalyst composites contg. cation exchangers, carbon particles, and catalyst metals with the carbon, contacting proton conducting pass of the ion exchanger, carrying >50% of the total catalyst metals. The **electrodes** are manufd. by adsorption of catalyst metal-contg. **cation** on **cation exchange resin** mixt. with carbon particles, by ion exchange between the catalyst metal-contg. cation and the counter ion of the cation exchanger, followed by redn. of the cation. A similar process for manuf. of the **electrodes** with catalyst metals having a core-sheath structure consisting of core metals (X), e.g. Mg, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ag, and/or W, and Pt-group sheath metals is also claimed. The process includes adsorption of X-contg. cations and their redn.
IC ICM H01M004-88
ICS H01M004-92
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST catalyst **cation exchange resin** **fuel cell electrode**; platinum group metal **fuel cell electrode**; redn catalyst cation **fuel cell electrode**
IT Platinum-group metals
(catalysts; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT Fluoropolymers, uses
(**electrodes** also contg.; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst

utilization)
IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, Nafion; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT Cation exchange
Cation exchangers
Fuel cell electrodes
Reduction
(manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT Carbon black, uses
(manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers, Nafion; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., Nafion; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7439-95-4, Magnesium, uses 7439-96-5, Manganese, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-33-7, Tungsten, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses 7440-62-2, Vanadium, uses 7440-66-6, Zinc, uses
(catalyst metal core; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT **9002-84-0, Teflon** 30J
(**electrodes** also contg.; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT 7440-44-0, Carbon, uses
(manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT 7440-06-4P, Platinum, uses
(manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)

IT 13138-45-9, Nickel dinitrate
(redn. for catalyst metal core formation; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)
IT 72951-00-9, Tetraamminedichloroplatinum
(redn. of; manuf. of **fuel cell electrodes** by redn. of catalyst ion-exchanged carbon-cation exchanger mixts. for high catalyst utilization)

L99 ANSWER 10 OF 54 HCA COPYRIGHT 2004 ACS on STN
134:342541 Phosphoric acid **fuel cells** with **electrode catalyst** layers containing fluoropolymers. Hanasawa, Makoto (Fuji Electric Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001135319 A2 20010518, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-313836 19991104.
AB The **electrode catalyst** layers of the **fuel cells** comprise **catalyst** particles and water-repellent fluoropolymers of mol. wt. ≥10,000,000. High-performance **fuel cells** having long service life are obtained by prevention of fluidization of the fluoropolymers.
IC ICM H01M004-86
ICS C08F014-26
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST phosphoric acid **fuel cell catalyst** layer; PAFC **catalyst** layer ultrahigh mol wt fluoropolymer; ultrahigh mol wt fluoropolymer **fuel cell electrode; water repellent** fluoropolymer **catalyst layer fuel cell**
IT Perfluoro compounds
Vinyl compounds, uses
(perfluoroalkyl vinyl ether polymers, with tetrafluoroethylene; phosphoric acid **fuel cells** with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)
IT Ethers, uses
(perfluoroalkyl vinyl, polymers, with tetrafluoroethylene; phosphoric acid **fuel cells** with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)
IT **Fuel cell electrodes**
(phosphoric acid **fuel cells** with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)
IT **Fuel cells**
(phosphoric acid; phosphoric acid **fuel cells**

with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)

IT Fluoropolymers, uses
(ultrahigh-mol.-wt.; phosphoric acid **fuel cells** with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)

IT 116-14-3D, Tetrafluoroethylene, copolymers with perfluoroalkylvinyl ethers **9002-84-0, Polytetrafluoroethylene** 25067-11-2, Hexafluoropropylene-tetrafluoroethylene copolymer
(ultrahigh-mol.-wt.; phosphoric acid **fuel cells** with **catalyst** layers comprising of fluoropolymers having ultrahigh mol. wt.)

L99 ANSWER 11 OF 54 HCA COPYRIGHT 2004 ACS on STN
134:254701 **Fuel cell electrodes**, their manufacture, and **fuel cells**. Isono, Takahiro; Kabumoto, Hiroki; Konno, Yoshihito; Yonetsu, Ikuo (Sanyo Electric Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001093544 A2 20010406, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-270837 19990924.

AB **Electrodes** for polymer electrolyte **fuel cells** have a catalyst layer on a gas diffusion layer, which has a substrate coated with an **ion exchanger resin** layer at least on the side facing the catalyst layer. The **electrodes** are prepd. by applying an **ion exchanger resin** on a gas diffusion layer substrate, and applying a catalyst layer on the coated gas diffusion layer. The **fuel cells** use **cathodes** and **anodes** having the described structure.

IC ICM H01M008-02
ICS H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST polymer electrolyte **fuel cell electrode** structure

IT **Fuel cell electrodes**
(**electrodes** contg. catalyst layers on **ion exchanger resin** coated gas diffusion substrates for polymer electrolyte **fuel cells**)

IT Carbon fibers, uses
Fluoropolymers, uses
(**electrodes** contg. catalyst layers on **ion exchanger resin** coated gas diffusion substrates for polymer electrolyte **fuel cells**)

IT Sulfonic acids, uses
(perfluorocarbon; **electrodes** contg. catalyst layers on **ion exchanger resin** coated gas diffusion substrates for polymer electrolyte **fuel cells**)

IT 7440-06-4, Platinum, uses
(**electrodes** contg. catalyst layers on **ion exchanger resin** coated gas diffusion substrates for polymer electrolyte **fuel cells**)
IT **9002-84-0, Polytetrafluoroethylene**
(**electrodes** contg. catalyst layers on **ion exchanger resin** coated gas diffusion substrates for polymer electrolyte **fuel cells**)

L99 ANSWER 13 OF 54 HCA COPYRIGHT 2004 ACS on STN
134:59136 **Fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance. Cavalca, Carlos; Arps, James H.; Murthy, Mahesh (Gore Enterprise Holdings, Inc., USA). PCT Int. Appl. WO 2000079630 A2 20001228, 125 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US16645 20000616. PRIORITY: US 1999-335718 19990618.
AB An **electrode**-membrane combination for use in a **fuel cell** provides improved power outputs and resistance to poisoning. Multiple embodiments are described which generally involve use of a vapor deposited zone or layer or one or more catalytically active metals. Vapor deposition can be carried out by, for example, sputtering or phys. vapor deposition.
IC ICM H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 56
ST **fuel cell** membrane **electrode** assembly poison resistance
IT Vapor deposition process
(chem.; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Ion beams
(deposition; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Catalysts
(electrocatalysts; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Ionomers
(fluoropolymers; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)

IT Conducting polymers
Fuel cell electrodes
Fuel cells
Ion beam sputtering
Ion exchangers
Magnetron sputtering
Poisoning, catalytic
(**fuel cell membrane electrode** assemblies with improved power outputs and poison resistance)
IT Noble metals
(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Alloys, uses
(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Fluoropolymers, uses
(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Fluoropolymers, uses
(ionomers; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Vapor deposition process
(jet; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Transition metal alloys
(noble metal; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Electron beams
(phys. vapor deposition; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT Vapor deposition process
(phys.; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses 12714-36-2, Platinum 50, ruthenium 50 atomic 51402-57-4 62389-16-6 117393-48-3 120561-15-1 154605-75-1 190711-69-4, Molybdenum 25, platinum 75 atomic
(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT 7440-44-0, Carbon, uses 9002-84-0, **Ptfe** 190673-42-8, Gore-Select 198716-71-1, Flemion 950EW
(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)
IT 1333-74-0, Hydrogen, uses

(**fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)

IT 630-08-0, Carbon monoxide, miscellaneous
(poisoning by; **fuel cell** membrane **electrode** assemblies with improved power outputs and poison resistance)

L99 ANSWER 15 OF 54 HCA COPYRIGHT 2004 ACS on STN
133:298827 Manufacture of polymer electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**. Yoshitake, Masaru; Kunisa, Yasuhiro; Endo, Eiji; Yanagisawa, Eiji (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000294258 A2 20001020, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-96879 19990402.

AB The method involves bonding of (A) a perfluorocarbon **polymer**-based **ion-exchange membrane** fixed on a substrate and (B) a gas-diffusion **electrode** with an adhesive contg. the perfluorocarbon polymer as a solute, followed by peeling the substrate from the **ion-exchange membrane**. The method can be carried out at ambient temp. and prevent wrinkle formation of the **ion-exchange membrane**.

IC ICM H01M008-02
ICS H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST polymer electrolyte **fuel cell** bonding **electrode** membrane; PEFC gas diffusion **electrode** bonding membrane; **ion exchange membrane** bonding **electrode** PEFC

IT Carbon black, uses
Fluoropolymers, uses
(gas-diffusion **electrode** contg.; manuf. of polymer electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT Fluoropolymers, uses
(**ion-exchange membrane**; manuf. of **polymer** electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT Solid state **fuel cells**
(manuf. of polymer electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT Polyesters, uses
(support film for **ion-exchange membrane**; manuf. of **polymer** electrolyte

fuel cell involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT 7440-06-4, Platinum, uses **9002-84-0, PTFE** (gas-diffusion **electrode** contg.; manuf. of polymer electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT 31175-20-9 (**ion-exchange membrane**; manuf. of **polymer** electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

IT 25038-59-9, PET (polyester), uses (support film for **ion-exchange membrane**; manuf. of **polymer** electrolyte **fuel cell** involving bonding of **ion-exchange membrane** with gas-diffusion **electrode**)

L99 ANSWER 19 OF 54 HCA COPYRIGHT 2004 ACS on STN

131:146953 A method of forming a membrane **electrode** assembly for a direct-feed **fuel cell**. Kindler, Andrew; Dawson, Stephen F. (California Institute of Technology, USA). PCT Int. Appl. WO 9939840 A1 19990812, 22 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US2835 19990209. PRIORITY: US 1998-21694 19980210.

AB A catalyst-coated **electrode** for a **fuel cell** is prepd. by mixing a catalyst (e.g., Pt or Pt-Ru) with a water repellent material (e.g., PTFE) to form a catalyst ink that is applied to an **electrode** backing material (e.g., porous carbon fiber sheet). The coated **electrode** is sintered under N2, cooled to 25°C, then coated with a liq. ionomer (e.g., Nafion--a perfluorovinylether sulfonic acid-tetrafluoroethylene copolymer) forming an **anode** or **cathode**. A solid electrolyte membrane, e.g., a perfluorinated proton exchange membrane, is pretreated (with isopropanol) to soften and swell the membrane prior to hot press bonding between the **anode** and **cathode** to form a membrane **electrode** assembly. Swelling the membrane before bonding results in shrinkage at the interface during use, reducing

delamination. The **electrode** assembly can be used in a direct-feed methanol **fuel cell**.

IC ICM B05D005-12
ICS H01M004-00; H01M008-10; H01M004-86; B23P019-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST membrane **electrode** assembly prepn **fuel cell**; **fuel cell** direct feed membrane **electrode** assembly

IT **Fuel cells**
(direct-feed; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Polyoxyalkylenes, uses
(fluorine-contg., sulfo-contg., ionomers; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT **Electrodes**
(gas-diffusion; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT **Cation exchange membranes**
Fuel cell electrodes
(**membrane electrode** assembly prepn. for direct-feed **fuel cells**)

IT Fluoropolymers, uses
(membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT **Fuel cell** electrolytes
(membranes; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Fluoropolymers, uses
(membranes; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Fluoropolymers, uses
Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT Carbon fibers, uses
(sheets, porous, **electrode** backing material; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT 9083-53-8, Triton

(dispersing agent; membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses
(membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT **9002-84-0**
(membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

IT 67-63-0, Isopropanol, uses 7727-37-9, Nitrogen, uses
(membrane **electrode** assembly prepn. for direct-feed **fuel cells**)

L99 ANSWER 26 OF 54 HCA COPYRIGHT 2004 ACS on STN
123:174986 Manufacture of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates.
Kaneko, Minoru; Saito, Toshihiko (Sanyo Electric Co, Japan). Jpn. Kokai Tokkyo Koho JP 07176317 A2 19950714 Heisei, 6 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 1993-320268 19931220.

AB The **electrode**/**ion exchanger membrane** laminates are manufd. by: prepg. an **electrode** contg. at lease a catalyst layer, forming an **ion exchanger membrane** on the **electrode** by a dripping method on a substrate, laminating the **ion exchanger membrane** and the **electrode**, and removing the substrate. The laminates may also be manufd. by prepg. a **ion exchanger membrane** on a substrate by a dripping method, applying an **electrode** catalyst layer on the **ion exchanger membrane**, and removing the substrate. The **electrode**/ion exchanger/**electrode** laminates are manufd. by joining 2 **electrode**/ion exchanger laminates at their ion exchanger sides. This method is esp. useful in **fuel cell** manuf.

IC ICM H01M008-10
ICS H01M004-88; H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell electrode** ion exchanger laminate

IT Ion exchangers
(manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)

IT Carbon black, uses
(manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers, manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)

IT **Electrodes**
(**fuel-cell**, manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)
IT Fluoropolymers
(polyoxyalkylene-, sulfo-contg., ionomers, manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)
IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg., manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)
IT 7440-06-4, Platinum, uses
(**electrode** catalyst; manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)
IT **9002-84-0, Ptfe**
(manuf. of **electrode**/ion exchanger and **electrode**/ion exchanger/**electrode** laminates)

L99 ANSWER 31 OF 54 HCA COPYRIGHT 2004 ACS on STN
118:111767 Advances in the use of perfluorinated **cation exchange membranes** in integrated water electrolysis and hydrogen/oxygen **fuel cell** systems. Holze, Rudolf; Ahn, Jochen (Fachbereich Chem., Carl von Ossietzky Univ., Oldenburg, W-2900, Germany). Journal of Membrane Science, 73(1), 87-97 (English) 1992. CODEN: JMESDO. ISSN: 0376-7388.
AB The application of a perfluorinated **cation exchange membrane** (Nafion 117) in electrochem. cells suitable for alternative operation as a water electrolyzer and a H/O **fuel cell** was investigated. Various methods used for the prepn. of membrane-**electrode** units were applied; the performance of the units prepd. with these methods in **fuel cell** and electrolyzer modes of operation is evaluated. Inherent advantages of a direct prepn. of the catalyst layer on the membrane surface by electroless deposition could be realized only in case of platinum **electrodes**. In case of all other **electrode** materials, including various noble metals and their oxides (pure or in binary compn.), suitable membrane-**electrode** units were fabricated from PTFE-bonded catalyst layers subsequently pressed onto the membrane. Exptl. results obtained with respect to performance and long-term stability are reported and discussed; further lines of development are indicated.
CC 72-2 (Electrochemistry)
Section cross-reference(s): 38, 49, 52
ST Nafion membrane integrated electrolyzer **fuel cell**

; hydrogen oxygen **fuel cell** electrolyzer
integrated; PTFE bonded catalyst electrolyzer **fuel cell**; water electrolyzer **fuel cell**
Nafion membrane

IT **Fuel cells**
(hydrogen-oxygen, in system with integrated water electrolysis using perfluorinated **cation exchange membranes**)

IT Electrolysis catalysts
(of metals and oxides, PTFE-bonded, on **ion-exchange membranes**)

IT Surface structure
(of platinum black-PTFE catalyst and iridium oxide-ruthenium oxide with PTFE on **ion exchange membranes**)

IT Electrolytic cells
(diaphragm, for water electrolysis in system with hydrogen-oxygen **fuel cell**)

IT **Cation exchangers**
(**membranes**, Nafion, in integrated water electrolysis and hydrogen-oxygen **fuel cell** systems)

IT 66796-30-3, Nafion 117
(**cation-exchanging membrane**, in integrated water electrolysis and hydrogen-oxygen **fuel cell** systems)

IT 7440-06-4, Platinum, uses
(**electrodes** from **PTFE**-bonded catalyst layers of, oxygen redn. at, perfluorinated **cation exchange membranes** in integrated water electrolysis system with hydrogen-oxygen **fuel cell** in relation to)

IT **9002-84-0, PTFE**
(**electrodes** from catalyst layers bonded with, on **ion exchange membranes**, **fuel cell** and electrolyzer modes in relation to)

IT 7732-18-5, Water, reactions
(electrolysis of, perfluorinated **cation exchange membrane** in integrated system for hydrogen-oxygen **fuel cell** and)

IT 1333-74-0P, Hydrogen, preparation 7782-44-7P, Oxygen, preparation
(evolution of, in water electrolysis, perfluorinated **cation exchange membranes** in integrated water electrolysis system with hydrogen-oxygen **fuel cell** in relation to)

IT 11113-84-1, Ruthenium oxide
(surface structure of catalyst from iridium oxide and, with PTFE on **ion exchange membrane**)

IT 12645-46-4, Iridium oxide

(surface structure of catalyst from ruthenium oxide and, with PTFE on **ion exchange membrane**)

L99 ANSWER 35 OF 54 HCA COPYRIGHT 2004 ACS on STN
109:199940 A composite membrane/**electrode** structure having interconnected roadways of catalytically active particles.
McMichael, James W.; Door, Robert D. (Dow Chemical Co., USA). Eur. Pat. Appl. EP 275465 A1 19880727, 13 pp. DESIGNATED STATES: R: AT, BE, CH, DE, ES, FR, GB, IT, LI, LU, NL, SE. (English). CODEN: EPXXDW. APPLICATION: EP 1987-118344 19871210. PRIORITY: US 1986-944396 19861219; US 1986-944278 19861219; US 1986-944279 19861219; US 1986-944475 19861219.

AB The structure is fabricated by at least partially coating ≥1 surface(s) of a planar screen template having openings ≤75% of the surface area) with a no. of catalytically active particles (e.g., Ru oxide); contacting a planar surface of an **ion-exchange membrane** with the coated surface of the screen template; transferring the catalytically active particles from the screen template to the membrane; removing the screen template; and bonding the catalytically active particles to the membrane. The catalytically active particles (contg.-elec. conductive metal particles) are coated onto the screen in the form of a soln./dispersion in which the solvent is a halocarbon (esp. 1,2-dibromotetrafluoroethane) and the dispersion contains an ionomer (e.g., carboxylic ion exchange fluoropolymer particles). The membrane/**electrode** structures are used in a variety of electrochem. **cells** (**fuel cells**, electrolysis **cells**, and batteries).

IC ICM C25B011-20
ICS H01M008-10

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52

ST composite membrane **electrode** structure; **fuel cell** composite membrane **electrode**; electrolysis cell composite membrane **electrode**; battery composite membrane **electrode**; catalytic particle composite membrane **electrode**

IT Fluoropolymers
(binders, for composite membrane/**electrode** structures)

IT **Electrodes**
(composite structures of membranes and, contg. catalytically active particles, for electrochem. cells)

IT 11104-61-3, Cobalt oxide (unspecified) 11113-77-2, Palladium oxide (unspecified) 11113-84-1, Ruthenium oxide (unspecified) 11129-89-8, Platinum oxide (unspecified) 12645-46-4, Iridium oxide (unspecified) 12680-36-3, Rhodium oxide (unspecified)
(composite membrane/**electrode** structures contg. catalytically active, for electrochem. cells)

IT 9002-84-0, **PTFE**
(composite structures of **electrodes** and, contg. catalytically active particles, for electrochem. cells)
IT 7440-02-0, Nickel, uses and miscellaneous 7440-06-4, Platinum, uses and miscellaneous 7440-22-4, Silver, uses and miscellaneous 7440-25-7, Tantalum, uses and miscellaneous 7440-57-5, Gold, uses and miscellaneous
(in catalytically active oxides for composite membrane/**electrode** structures)
IT 124-73-2, 1,2-Dibromotetrafluoroethane
(in fabrication of composite membrane/**electrode** structures)

L99 ANSWER 51 OF 54 HCA COPYRIGHT 2004 ACS on STN
72:96083 **Electrodes** for **fuel cells.**
Clark, Milton Bedford; Kordesch, Karl V. (Union Carbide Corp.). Ger. Offen. DE 1941770 19700226, 12 pp. (German). CODEN: GWXXBX. PRIORITY: US 19680822.
AB A dual porosity **fuel-cell electrode** for use as **anode** or **cathode** infuel cells, is described. In contrast to other such **electrodes** (Brit. 1,072,577) the wettable layer lies on the electrolyte side, the **water-repellant layer** faces the gas side. Typically, the wettable layer is made of a porous metal such as Ni, while the nonwettable layer is the **catalyst** material bonded with a plastic. The configuration minimizes seepage of the electrolyte into the **catalytic** layer, and permits continuing circulation of reactant gases. The porous metal layer may be made of Ni, Fe, Ag, Cu, stainless steel, Ta, Raney Ni, etc. Its av. pore size will be 1-20 μ, preferably 2-10 μ. The **catalytically** active materials can be particles of carbon, graphite, Ag, Au, Ni, noble metals, or borides such as Ni boride. Binders may be polyethylene, polystyrene, **poly**(**tetrafluoroethylene**), **poly**(perfluorochloroethylenes), **poly**-(vinyl chloride), etc. The particle size of the active materials is not crit. Carbon of 0.05-50 μ, metal powders of 7-150 μ, or noble metal particles of 150 Å may be used. From 25-50% of the total wt. of the active layer might be binder. Large areas of **electrode** can be made by rolling the 2 layers together, with 7-140 kg/cm2 roll pressure or by application of a slurry of the active layer to the metal. In one example, a slurry of 0.025 g polythene, 50 ml toluene, and 0.5 g active carbon contg. Pd **catalyst** was applied to a porous Ni plate. Excess polyethylene was removed from the untreated face of the metal. As an O **electrode** in 15M KOH, 50 mA/cm2 at 1.39V vs. Zn was obtained. The **electrode** can also be used as a H **anode.** Two other examples are given.

IC H01M
CC 77 (Electrochemistry)
ST **fuel cells electrodes;**
electrodes fuel cells; hydrogen
electrodes fuel cells; oxygen
electrodes fuel cells
IT **Fuel cells**
(**electrodes,** porous, bipolar)
IT **Electrodes**
(**fuel-cell,** porous, bipolar)
IT 7440-05-3, uses and miscellaneous
(**catalysts, fuel-cell**)

L99 ANSWER 53 OF 54 HCA COPYRIGHT 2004 ACS on STN
66:101105 **Electrode** structure and **fuel cell** incorporating it. Niedrach, Leonard W. (General Electric Co.). U.S. US 3297484 19670110, 10 pp. (English). CODEN: USXXAM. APPLICATION: US 19610508.
AB A method is described for prepg. gaseous **fuel cells** from a pair of gas-adsorbing gas-permeable, hydrophobic, electronically conductive **electrode** elements in contact with a solid matrix having sorbed in them an aq. electrolyte. These **electrode** structures are suitable for cyclic operation wherein the cells generate electricity during the discharge period in which the fuel and oxidant gases are consumed and consume electricity during the charge period in which the fuel and oxidant gases are regenerated. To illustrate, a series of **electrodes** was prepd. by using 17 mg. Pt black and 1.6 mg. **poly(tetrafluoroethylene)**/cm.2 **electrode** area. Four different pressures in the range of 0-6900 psi. were applied for 2 min. at 350°. These **electrodes** were assembled in the **fuel cell** as the O **electrode** by using a H **electrode** formed of the same concn. but pressed at the high pressure so that the only variation was in the O **electrode.** The polarization characteristics of the cells were detd. under both charge and discharge operation using a matrix which was an **ion-exchange resin** having OH- as the mobile ion. It had been equilibrated in a 5.4 M KOH To permit easy comparison between the various cells, the polarization data for each cell were plotted on rectangular coordinates and cell potentials at rounded values of the current were read from the smooth curves through the data points. Results showed that the pressure used in forming the **electrodes** had no influence on the **electrode** performance. Temp. and time of forming operation can be varied appreciably without any effect on the cell performance. However, **electrodes** pressed at 330° were mech. weak, as compared to others and therefore 330° apparently represents

the min. temp. which should be used in pressing and fusing the **electrodes**. The **fuel cells** may be used for any application where a reliable source of d.c. elec. power is required to activate motors, instruments, radio transmitters, lights, heaters, etc.

NCL 136086000
CC 77 (Electrochemistry)
ST **ELECTRODES FUEL CELLS; FUEL CELLS ELECTRODES;** HYDROGEN **ELECTRODE FUEL CELLS**
IT **Electrodes**
(**fuel-cell**, palladium or platinum black catalytic, on tetrafluoroethylene polymers)
IT **Fuel cells**
(with palladium or platinum black catalytic **electrodes**, on tetrafluoroethylene polymers)
IT 9002-84-0, uses and miscellaneous
(**fuel-cell electrodes** from palladium or platinum black and)

=> file wpix
FILE 'WPIX' ENTERED AT 15:14:39 ON 06 APR 2004
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FILE LAST UPDATED: 5 APR 2004 <20040405/UP>
MOST RECENT DERWENT UPDATE: 200423 <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d l102 1-8 ti

L102 ANSWER 1 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Phosphoric acid type **fuel cell** contains **electrode catalyst** layer formed using **catalyst** particle and water repellent fluororesin particle of specified molecular weight.

L102 ANSWER 2 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Carbon layer, especially a **fuel cell electrode** starting material, is produced by dipping a bonded carbon fiber **layer** in a **water-repellant** particle dispersion and then firing.

L102 ANSWER 3 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Raney nickel and fluorine resin contg. **cathode** - consists of four layers, all including fluorine resin and some **catalyst**.

L102 ANSWER 4 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Nickel and fluorine contg. **cathode** - consists of Raney nickel, **catalytic** layer and fluorine resin.

L102 ANSWER 5 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell electrode** mfr. - by compacting together support, **catalytic layer** and **water repellent layer.**

L102 ANSWER 6 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell** - has **electrodes** which preserve the electrolyte at the hydrophilic layer.

L102 ANSWER 7 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Thin **catalysed** gas **electrode** - having low noble metal loading on **electrode** surface only.

L102 ANSWER 8 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Gas **electrode** for a **fuel cell.**

=> d l102 1,2,3,4,5 max

L102 ANSWER 1 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-491683 [54] WPIX
DNN N2001-363879 DNC C2001-147771
TI Phosphoric acid type **fuel cell** contains **electrode catalyst** layer formed using **catalyst** particle and water repellent fluororesin particle of specified molecular weight.
DC A14 A85 L03 X16
PA (FJIE) FUJI ELECTRIC CO LTD
CYC 1
PI JP 2001135319 A 20010518 (200154)* 4p H01M004-86
ADT JP 2001135319 A JP 1999-313836 19991104
PRAI JP 1999-313836 19991104
IC ICM H01M004-86
ICA C08F014-26
AB JP2001135319 A UPAB: 20010924
NOVELTY - Phosphoric acid type **fuel cell** contains an **electrode catalyst** layer which is formed using **catalyst** particle and water repellent fluororesin particle. The fluororesin particle has an ultra-high molecular weight of 10000000 or more.
USE - As **fuel cell** for use in electrochemical reactions.
ADVANTAGE - Fluidization of fluororesin at the time of heat

treatment of **electrode** is suppressed, hence destruction of fluororesin fiber is avoided. Electricity generation property is not reduced and life span characteristics are improved.
Dwg.0/4

TECH JP 2001135319 AUPTX: 20010924
TECHNOLOGY FOCUS - POLYMERS - Preferred Polymer: Ultra-high molecular weight fluororesins are **polytetrafluoroethylene,** tetrafluoroethylene/hexafluoroethylene copolymer or tetrafluoroethylene/perfluoroalkyl vinyl ether copolymer.

ABEX JP 2001135319 AUPTX: 20010924
EXAMPLE - Fluororesin particle of ultra-high molecular weight of 10000000 or more was dispersed in a solution along with catalyst particle and stirred. A surfactant is added and ultrasonic wave was impressed such that uniform dispersion was attained. A coagulant was added to the solution, an aggregate was formed and was subjected to rolling process. After rolling the sheet obtained was pressed with porous carbon base material. The sheet obtained was subjected to heat treating near the melting point of fluororesin, an electrode was formed and fuel cell was composed.

FS CPI EPI
FA AB
MC CPI: A99-A; L03-E04
EPI: X16-E06

L102 ANSWER 2 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-319455 [28] WPIX
CR 2000-262693 [23]
DNN N2000-239681 DNC C2000-097040
TI Carbon layer, especially a **fuel cell electrode** starting material, is produced by dipping a bonded carbon fiber **layer** in a **water-repellant** particle dispersion and then firing.
DC L03 X16
IN ISHII, M; OKAMOTO, H; SEKO, H
PA (AISE) AISIN SEIKI KK
CYC 3
PI DE 19940351 A1 20000427 (200028)* 13p H01M004-88
JP 2000136493 A 20000516 (200032) 8p D21H013-50
US 6331224 B1 20011218 (200205) D01F009-12
DE 19940351 B4 20040108 (200404) C04B035-83
ADT DE 19940351 A1 DE 1999-19940351 19990825; JP 2000136493 A JP 1999-213508 19990728; US 6331224 B1 US 1999-383195 19990826; DE 19940351 B4 DE 1999-19940351 19990825
PRAI JP 1999-213508 19990728; JP 1998-240743 19980826; JP 1998-240745 19980826
IC ICM C04B035-83; D01F009-12; D21H013-50; H01M004-88
ICS C04B035-528; H01M004-96; H01M008-10
AB DE 19940351 A UPAB: 20040115

NOVELTY - A carbon layer is produced by dipping a bonded carbon fiber **layer** in a **water-repellant** particle dispersion and then firing.

DETAILED DESCRIPTION - A carbon layer is produced by forming a layer of a carbon fiber and binder mixture, drying, dipping the layer in a dilute solution containing dispersed **water-repelling** particles, firing the **layer** and removing the binder by oxidation.

USE - For producing a carbon layer used especially as starting material for a fuel or oxygen **electrode** of a **fuel cell** e.g. of an electric vehicle.

ADVANTAGE - The carbon layer has reduced production cost and improved water repellant properties.

DESCRIPTION OF DRAWING(S) - The drawing shows a cross-sectional view of a **fuel cell** with **electrodes** made of carbon layers.

oxygen **electrode** 1
catalyst layers 1a, 2a
fuel **electrode** 2
membrane/**electrode** unit 10
fuel cell 20

Dwg.1/7

TECH DE 19940351 A1 UPTX: 20000613
TECHNOLOGY FOCUS - POLYMERS - The water-repelling particles may be **PTFE** particles.

FS CPI EPI
FA AB; GI
MC CPI: L03-E04B; L03-H05
EPI: X16-E06A

L102 ANSWER 3 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1984-261173 [42] WPIX
DNN N1984-195140 DNC C1984-110753
TI Raney nickel and fluorine resin contg. **cathode** - consists of four layers, all including fluorine resin and some **catalyst.**
AW **FUEL CELL.**
DC A14 A85 J03 L03 X16
PA (NIST) JAPAN STORAGE BATTERY CO LTD
CYC 1
PI JP 59160971 A 19840911 (198442)* 3p
ADT JP 59160971 A JP 1983-34284 19830301
PRAI JP 1983-34284 19830301
IC C25B011-03; H01M004-86
AB JP 59160971 A UPAB: 19930925
This **cathode** consists of a 1st layer comprising a mixt. of fluorine resin, a **catalyst** having low hydrogen overvoltage e.g. platinum gp. metal, and powders of carbon, Raney nickel, and

Raney iron, a 2nd layer of porous nickel **layer** which is not **waterproofed**, a 3rd **layer** of mixt. of fluorine resin and a **catalyst** effective for electrolytic redn. of oxygen, and a 4th layer of porous fluorine resin which is waterproofed.

Sintered carbonyl nickel has 80% porosity. On a 1 mm thickness nickel plate, Raney nickel powder (100 pts.) and carbonyl nickel powder (50 pts.) are sprayed after diffusion in 50 ml suspension comprising copolymer of tetrafluoroethylene and hexafluoropropylene.

Second layer is dried after spraying of carbon powder which is diffused in a 20% **PTFE** suspension.

ADVANTAGE - With addn. of 1st layer, deterioration of **cathode** is avoided even when hydrogen supply stops accidentally.

0/2

FS CPI EPI
FA AB
MC CPI: A04-E10; A12-E; J03-B01; L03-E01B; N02; N04-A
EPI: X16-E06
DRN 1669-U
PLC UPA 19930924
KS: 0210 0231 0941 0942 0947 0949 3168 0963 2424 2440 2501 3251 2653 2729 2739 3277 2743

FG: *001* 014 034 04- 062 064 087 089 27& 397 431 434 445 477 53& 532 533 535 56& 575 595 60- 623 627 688 722

L102 ANSWER 4 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1984-261172 [42] WPIX
DNN N1984-195139 DNC C1984-110752
TI Nickel and fluorine contg. **cathode** - consists of Raney nickel, **catalytic** layer and fluorine resin.
DC A14 A85 J03 L03 X16
PA (NIST) JAPAN STORAGE BATTERY CO LTD
CYC 1
PI JP 59160970 A 19840911 (198442)* 3p
ADT JP 59160970 A JP 1983-34282 19830301
PRAI JP 1983-34282 19830301
IC C25B011-03; H01M004-86
AB JP 59160970 A UPAB: 19930925
Raney nickel or Raney iron-contg. porous nickel layer, **catalytic** layer of powder and fluorine resin, and fluorine resin contg. **waterproof** porous **layer** comprise this **cathode**. Even when oxygen supply stops and hydrogen occurs, there is no deterioration of the **cathode**.

USE/ADVANTAGE - For **fuel cell** stoppage of oxygen supply causes generation of hydrogen. In this **cathode**, hydrogen generation takes place at porous nickel layer contg.

Raney **catalyst**. This layer is irrelevant to oxygen redn. so that no deterioration occurs.

In an example, powder mixt. of nickel and aluminium (50:50) is mixed with carbonyl nickel powder in the ratio of 1:9 and the mixt. is sintered to obtain a 1 mm plate. This plate is dipped in 40% potassium hydroxide for elution of aluminium. After washing with water and drying in vacuum, a porous nickel plate is obtd. On either of its surfaces, an oxygen redn. **catalytic** layer is formed, and consist of carbon powder with 10% platinum and **PTFE**. Then another **PTFE** porous film is formed on top.

0/1

FS CPI EPI
FA AB
MC CPI: A04-E10; A12-E06; A12-E09; J03-B01; L03-E04B
EPI: X16-E06
PLC UPA 19930924
KS: 0210 0231 0941 0942 0947 3251 2653 2739 3277

FG: *001* 014 034 04- 062 064 087 53& 532 533 535 56& 575 595 60-623 627 688

L102 ANSWER 5 OF 8 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1983-47299K [20] WPIX
DNN N1983-085172 DNC C1983-045892
TI **Fuel cell electrode** mfr. - by compacting together support, **catalytic layer** and **water repellent layer.**
DC A85 L03 X16
IN BREELLE, Y; GREHIER, A
PA (INSF) INST FRANCAIS DU PETROLE
CYC 9
PI EP 78748 A 19830511 (198320)* FR 10p
R: AT BE CH DE GB IT LI NL
FR 2515878 A 19830506 (198323)
PRAI FR 1981-20781 19811104
REP DE 1671456; GB 1273717
IC H01M004-86
AB EP 78748 A UPAB: 19930925
Mfr. is claimed of a **fuel cell electrode** having an electrically conducting support on which is deposited a **catalytic layer covered** with a **water repellent layer** formed by spraying with **PTFE**. The method includes pressing an assembly of support, **catalytic** structure and **water repellent layer.**

Specifically, the spraying is effected with the powder at a max. temp. of 40 deg.C, before pressing the assembly at a

predetermined pressure of at least 400 bars, the max. pressure being reached by increasing the pressure uniformly at at least 20 bars/sec.

The method does not involve applying and subsequently removing a layer of Al as in prior art, thus avoids damaging the **water repellent layer.**

FS CPI EPI
FA AB
MC CPI: A04-E08; A12-E06; L03-E04B
EPI: X16-E06
PLC UPA 19930924
KS: 0210 0231 0947 3220 3215 2344 2424 2426 2439 2443 2447 2492 2539 2541 3251 2728 2739 0009 1294 1297 2020 2528 2622 2745 2821

FG: *001* 013 04- 062 064 087 301 342 371 376 393 431 434 448 456 465 47& 477 491 493 53& 532 533 535 54& 55& 60- 623 627 688 720
FG: *002* 013 032 04- 150 231 240 371 376 473 481 483 53- 551 560 561 623 629 664 667

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FILE 'JAPIO' ENTERED AT 15:16:16 ON 06 APR 2004
COPYRIGHT (C) 2004 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 1 MAR 2004 <20040301/UP>
FILE COVERS APR 1973 TO NOVEMBER 28, 2003

=> d l105 1-12 ti

L105 ANSWER 1 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURING METHOD OF **ELECTRODE** FOR PHOSPHORIC ACID **FUEL CELL**

L105 ANSWER 2 OF 12 JAPIO (C) 2004 JPO on STN
TI **ELECTRODE CATALYST** COMPOSITION, **ELECTRODE** MATERIAL, AND MANUFACTURE THEREOF

L105 ANSWER 3 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**

L105 ANSWER 4 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURE OF **FUEL CELL ELECTRODE**

L105 ANSWER 5 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**

L105 ANSWER 6 OF 12 JAPIO (C) 2004 JPO on STN
TI AIR **ELECTRODE** FOR LIQUID **FUEL CELL** AND LIQUID **FUEL CELL** USING IT

L105 ANSWER 7 OF 12 JAPIO (C) 2004 JPO on STN
TI **ELECTRODE**-MATRIX BONDING BODY FOR **FUEL CELL** AND ITS MANUFACTURE

L105 ANSWER 8 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURE OF AIR **ELECTRODE**

L105 ANSWER 9 OF 12 JAPIO (C) 2004 JPO on STN
TI **ELECTRODE** FOR PHOSPHORIC ACID TYPE **FUEL CELL**

L105 ANSWER 10 OF 12 JAPIO (C) 2004 JPO on STN
TI MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**

L105 ANSWER 11 OF 12 JAPIO (C) 2004 JPO on STN
TI OXYGEN **ELECTRODE**

L105 ANSWER 12 OF 12 JAPIO (C) 2004 JPO on STN
TI ACID ELECTROLYTE TYPE LIQUID **FUEL CELL**

=> d l105 2,3,4,5,7,10 ibib abs ind

L105 ANSWER 2 OF 12 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1995-211324 JAPIO
TITLE: **ELECTRODE CATALYST** COMPOSITION, **ELECTRODE** MATERIAL, AND MANUFACTURE THEREOF
INVENTOR: MAEDA TOSHIYUKI; TAJIRI HIROYUKI; OKADA OSAMU
PATENT ASSIGNEE(S): OSAKA GAS CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07211324	A	19950811	Heisei	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1994-19916 19940119
ORIGINAL: JP06019916 Heisei
PRIORITY APPLN. INFO.: JP 1994-19916 19940119
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995
AN 1995-211324 JAPIO
AB PURPOSE: To retard drop in **water repellency** in a

catalyst layer, stably maintain a three-phase interface in the **catalyst** layer for a long period of time, and lengthen the life of the **catalyst** layer in a **fuel cell**.

CONSTITUTION: An **electrode catalyst** layer containing conductive powder such as carbon black on which a platinum **catalyst** is supported, a powdery binding resin having water repellency such as **polytetrafluoroethylene**(**PTFE**), and pitch fluoride is formed on a conductive base material. Pitch fluoride, different from fluororesin such as **PTFE**, has low melt viscosity, is soluble in a fluorine base solvent, and has higher water repellency than **PTFE**. Pitch fluoride can uniformly be permeated and diffused in the **catalyst** layer by baking the powdery pitch fluoride or impregnating a pitch fluoride solution, and a uniform three-phase interface is formed.

IC ICM H01M004-86
ICS C10C003-02; H01M004-88; H01M004-92; H01M008-02; H01M008-08
ICA C08L027-12

L105 ANSWER 3 OF 12 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1995-037592 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**
INVENTOR: YOSHIOKA HIROSHI; SUGIMOTO HARUKO
PATENT ASSIGNEE(S): TANAKA KIKINZOKU KOGYO KK
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07037592	A	19950207	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 1993-203033 19930723
ORIGINAL: JP05203033 Heisei
PRIORITY APPLN. INFO.: JP 1993-203033 19930723
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995

AN 1995-037592 JAPIO
AB PURPOSE: To provide an **electrode** for a **fuel cell** having an **electrode** reaction layer of long life with a high **catalytic** utilization factor by preparing dispersion liquid by using a ball mill in each material, in the case of forming the **electrode** reaction **layer** by using a **water repellent** material except **PTFE**

.

CONSTITUTION: In manufacturing an **electrode** for a

fuel cell having an **electrode** reaction layer consisting of water reppelent material except **PTFE** such as fluorinated polyethylene coating carbon, fluorocarbon or fluorinated pitch coating carbon, etc., the **electrode** for the **fuel cell**, characterized by using a ball mill to prepare dispersion fluid in each material of the **electrode** reaction layer, after mixing this dispersion fluid, applying this mixed fluid to a porous conductive substrate by the blade method, after drying and washing, press molding and baking the substrate, is manufactured.

IC ICM H01M004-88

L105 ANSWER 4 OF 12 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1992-269457 JAPIO

TITLE: MANUFACTURE OF **FUEL CELL ELECTRODE**

INVENTOR: YAMAMOTO NOBUO

PATENT ASSIGNEE(S): TANAKA KIKINZOKU KOGYO KK

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 04269457	A	19920925	Heisei	H01M004-88

APPLICATION INFORMATION

STN FORMAT: JP 1991-53364 19910225

ORIGINAL: JP03053364 Heisei

PRIORITY APPLN. INFO.: JP 1991-53364 19910225

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1992

AN 1992-269457 JAPIO

AB PURPOSE: To provide a method of manufacturing a **fuel cell electrode** in which a **catalyst** particle of platinum and the like carried in the **electrode** of a **fuel cell electrode** is effectively utilized in contact with an electrolyte.

CONSTITUTION: A method comprises mixing a carbon carrier with **PTFE**, applying the mixture onto a carbon **sheet** subjected to **water repellent** finishing followed by baking to form a thin plate, and carrying a **catalytic** particle of platinum and the like onto the carbon carrier by means of ion plating method.

IC ICM H01M004-88

L105 ANSWER 5 OF 12 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1992-220952 JAPIO

TITLE: MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**
INVENTOR: YAMAMOTO NOBUO
PATENT ASSIGNEE(S): TANAKA KIKINZOKU KOGYO KK
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 04220952	A	19920811	Heisei	H01M004-88

APPLICATION INFORMATION
STN FORMAT: JP 1990-412026 19901219
ORIGINAL: JP02412026 Heisei
PRIORITY APPLN. INFO.: JP 1990-412026 19901219
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1992

AN 1992-220952 JAPIO
AB PURPOSE: To fabricate an **electrode** for **fuel cell**, with which **catalyst** particles of Pt, etc., borne by a carbon carrier can make high rate contacting with the electrolyte, by adopting the constitution according to the invention as described hereunder.
CONSTITUTION: An **electrode** for a **fuel cell** is fabricated through such procedures as dipping a carbon carrier in water, filtrating, drying, and crushing. This bears a **catalyst** metal such as Pt and mixed with a carbon carrier bearing **catalyst** metal and **teflon** dispersion of **polytetrafluoroethylene**, and is applied onto a carbon **sheet** having undergone a **water repelling** process, and the resultant therefrom is dried and baked to produce a thin plate as a final product. Thus the intended purpose is embodied.

IC ICM H01M004-88

L105 ANSWER 7 OF 12 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1987-010865 JAPIO
TITLE: **ELECTRODE**-MATRIX BONDING BODY FOR **FUEL CELL** AND ITS MANUFACTURE
INVENTOR: MIYOSHI HIDEAKI
PATENT ASSIGNEE(S): MITSUBISHI ELECTRIC CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 62010865	A	19870119	Showa	H01M004-86

APPLICATION INFORMATION

STN FORMAT: JP 1985-150363 19850705
ORIGINAL: JP60150363 Showa
PRIORITY APPLN. INFO.: JP 1985-150363 19850705
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1987

AN 1987-010865 JAPIO
AB PURPOSE: To improve bonding ability of a **catalyst** layer with a matrix layer by dividing a **cathode** layer into two **layers**, and weakening **water repellent** ability of the second **catalyst** layer on a matrix side than that of the first **catalyst** layer on an **electrode** base material side.
CONSTITUTION: For example, the first **catalyst** layer 4 comparising a **catalyst** made of carbon powder supported with platinum and **polytetrafluoroethylene** serving as binder is formed on an **electrode** base material 1. The second **catalyst** layer 5 comprising a **catalyst** made of carbon powder supported with platinum and **polytetrafluoroethylene** serving as binder is formed on the first **catalyst** layer 4, then they are sintered. A matrix layer 3 comprising matrix agent and **polytetrafluoroethylene** serving as binder is formed on the second **catalyst** layer 5, and sintered. Thereby, the bonding ability of the **catalyst** layer with the matrix layer is improved.
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IC ICM H01M004-86
ICS H01M004-88; H01M008-02

L105 ANSWER 10 OF 12 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1985-041764 JAPIO
TITLE: MANUFACTURE OF **ELECTRODE** FOR **FUEL CELL**
INVENTOR: SAKURAI MASAHIRO
PATENT ASSIGNEE(S): FUJI ELECTRIC CORP RES & DEV LTD
FUJI ELECTRIC CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 60041764	A	19850305	Showa	H01M004-86

APPLICATION INFORMATION
STN FORMAT: JP 1983-149458 19830816
ORIGINAL: JP58149458 Showa
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AB PURPOSE: To realize an electrolyte-controlling function by forming hydrophilic connection areas in a **catalyst layer** by thermally decomposing **water repellent** **PTFE** contained in parts of the **catalyst** layer corresponding to electrolyte reservoirs installed in a porous **electrode** base material.
CONSTITUTION: A **catalyst** layer 3 is provided with areas 8 for connecting electrolyte reservoirs 7 and a matrix 4. The connection areas 8 are not holes or grooves formed in the **catalyst** layer 3. They are formed for example by giving ultrasonic vibration to spotlike areas of the **catalyst** layer 3 corresponding to the electrolyte reservoirs 7 to heat and decompose the water repellent binder **PTFE** contained in the **catalyst** layer 3 at about 400°C. Therefore the areas 8 are hydrophilic areas which can be permeated by electrolyte. By properly selecting the shape of an **electrode** used to transfer the vibration of an ultrasonic oscillator, the hydrophilic connection areas 8 which can be well permeated by the electrolyte can be formed in the **catalyst** layer 3 for example in a dot-like shape with a diameter of around 1mm or in a linear shape of around 1mm width. A high dimensional accuracy is achieved by performing such an ultrasonic process.

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